AT1369

Preliminary Product Information

2-Channel Synchronous Buck PWM Controller with Power Good Reset

Features

- High efficiency (min. 90% On I_O=300mA ~600mA)
- Using external P and N channel MOSFET
- Maximum Duty 100%
- Oscillation frequency 300KHz or 600KHz
- Soft Start by an external capacity
- Output voltage accuracy ±2%
- Built-in ON/OFF Function
- Built-in Short-circuit Protection
- Stand-by current max. 10μA
- Quiescent Current 1.5mA
- Built-in Power Good reset circuit
- Input voltage: 2.5V ~7.0V

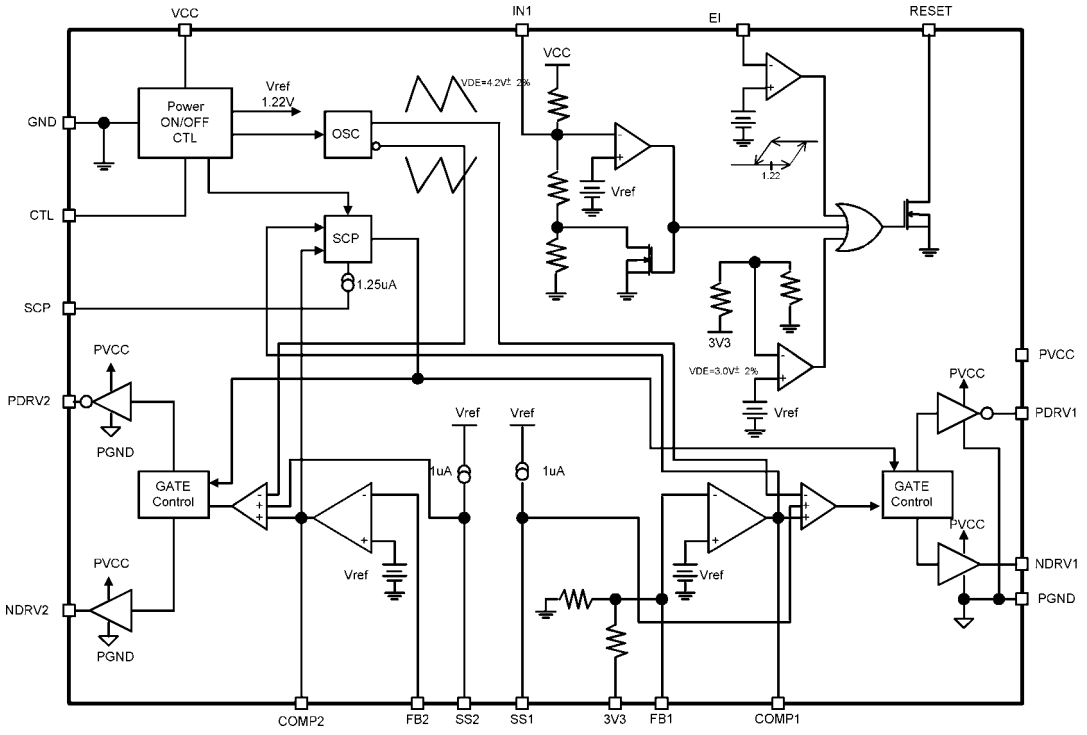
Applications

- Slim-Type CD-ROM/DVD-ROM/CD-RW
- Power Supply for portable devices

General Description

The AT1369 provides complete control and protection for a DC/DC converter optimized for high-performance microprocessor applications. It is designed to drive one P-Channel and one N-Channel MOSFETs in a synchronous-rectified buck topology. The AT1369 integrates all of the control, output adjustment, monitoring and protection functions into a single package. The output voltage of the converter can be precisely regulated with a maximum tolerance of ±2% over temperature and line voltage variations. The AT1369 is a family of low-noise synchronous step-down DC/DC converters that is ideally suited for systems powered from a 1-cell Li-ion battery or from a 3-cell to 4-cell NiCd, NiMH, or alkaline battery. It can also be used to USB-Based power system.

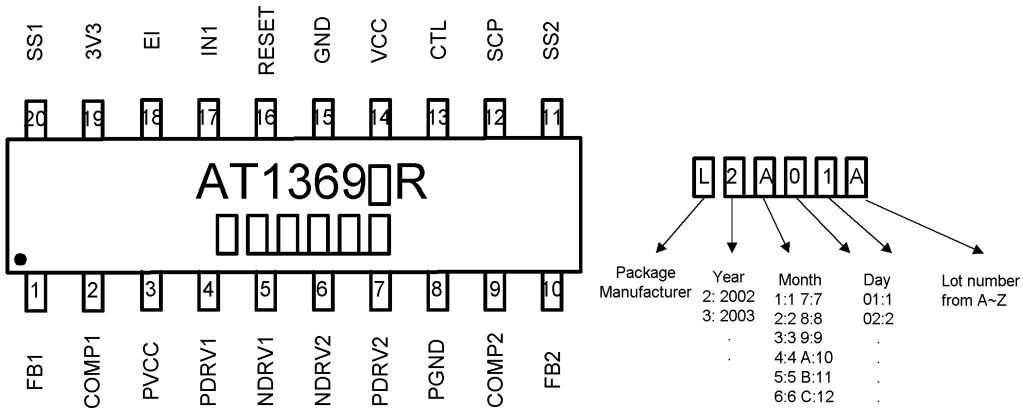
Block Diagram



Aimtron reserves the right without notice to change this circuitry and specifications.

2F, No.10, Prosperity RD. II, Science-Based Industrial Park, Hsinchu 300,Taiwan, R.O.C.
Tel: 886-3-563-0878 WWW: http://www.aimtron.com.tw
Fax: 886-3-563-0879 Email: service@aimtron.com.tw

Pin Configuration



Ordering Information

Part number	Package	Marking
AT1369A	SSOP20	AT1369AR
AT1369B	SSOP20	AT1369BR

A: fosc =300KHz B: fosc =600KHz

Pin Description

Symbol	Pin No.	Descript	Symbol	Pin No.(A/B)	Descript
FB1	1	Inverting input to error amplifier 1	**SS2**	11	Sotf-start 2
COMP1	2	Error amplifier1 output	**SCP**	12	Short-Circuit protection
PVCC	3	Power blocks power supply	**CTL**	13	Chip enable, high active
PDRV1	4	Output1 for Pch-MOSFET	**VCC**	14	Control blocks power supply
NDRV1	5	Output1 for Nch-MOSFET	**GND**	15	Control blocks ground
NDRV2	6	Output2 for Nch-MOSFET	**RESET**	16	Power Good indicator
PDRV2	7	Output2 for Pch-MOSFET	**IN1**	17	VCC monitor voltage adjustable input pin
PGND	8	Power blocks ground	**EI**	18	Adjustable Reset input
COMP2	9	Error amplifier1 output	**3V3**	19	Output voltage 3.3V
FB2	10	Inverting input to error amplifier 2	**SS1**	20	Sotf-start 1

Absolute Maximum Ratings

Parameter	Condition	Rated Value		Unit
		Min.	Max.	
Power Supply Voltage	—	-	+8	V
Source Average Current of PDRV1,NDRV1 PDRV2,NDRV2	—	-	-50	mA
Sink Average Current of PDRV1,NDRV1, PDRV2,NDRV2	—	-	50	mA
Source Peak Current of PDRV1,NDRV1, PDRV2,NDRV2	—	-	-200	mA
Sink Peak Current of PDRV1,NDRV1, PDRV2,NDRV2	—	-	200	mA
Input Voltage to Error Amplifier	—	-	6.5	V
Continuous power dissipation	SSOP20（T_a=+25℃）	-	560	mW
Operating temperature	—	-30	+85	^{0}C
Storage temperature	—	-55	+125	^{0}C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

(Ta=+25^{0}C)

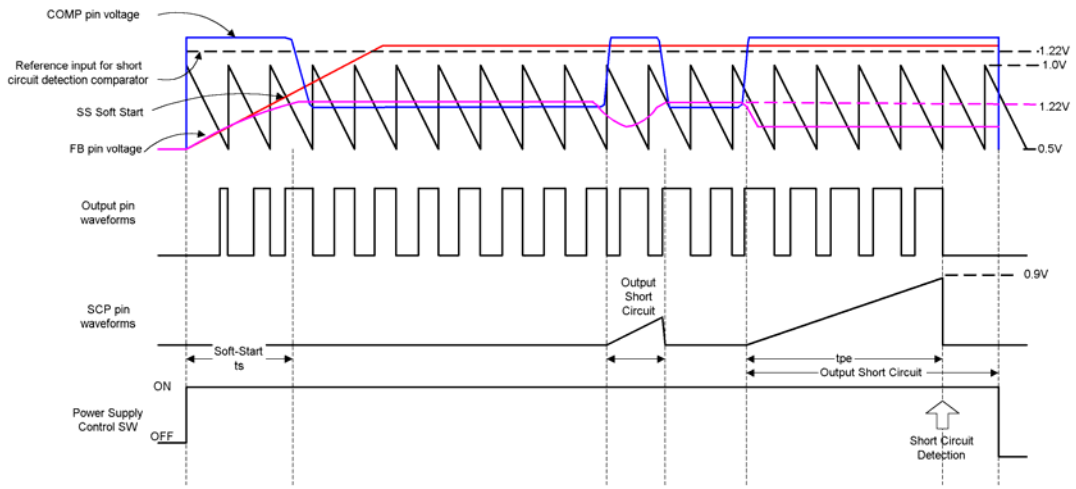
Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Power supply voltage	V_{CC}	2.5	--	7	V
Control input voltage	V_{CTL}	0	--	7	V
Operating temperature	T_{OP}	-20	+25	+85	℃

Electrical Characteristics

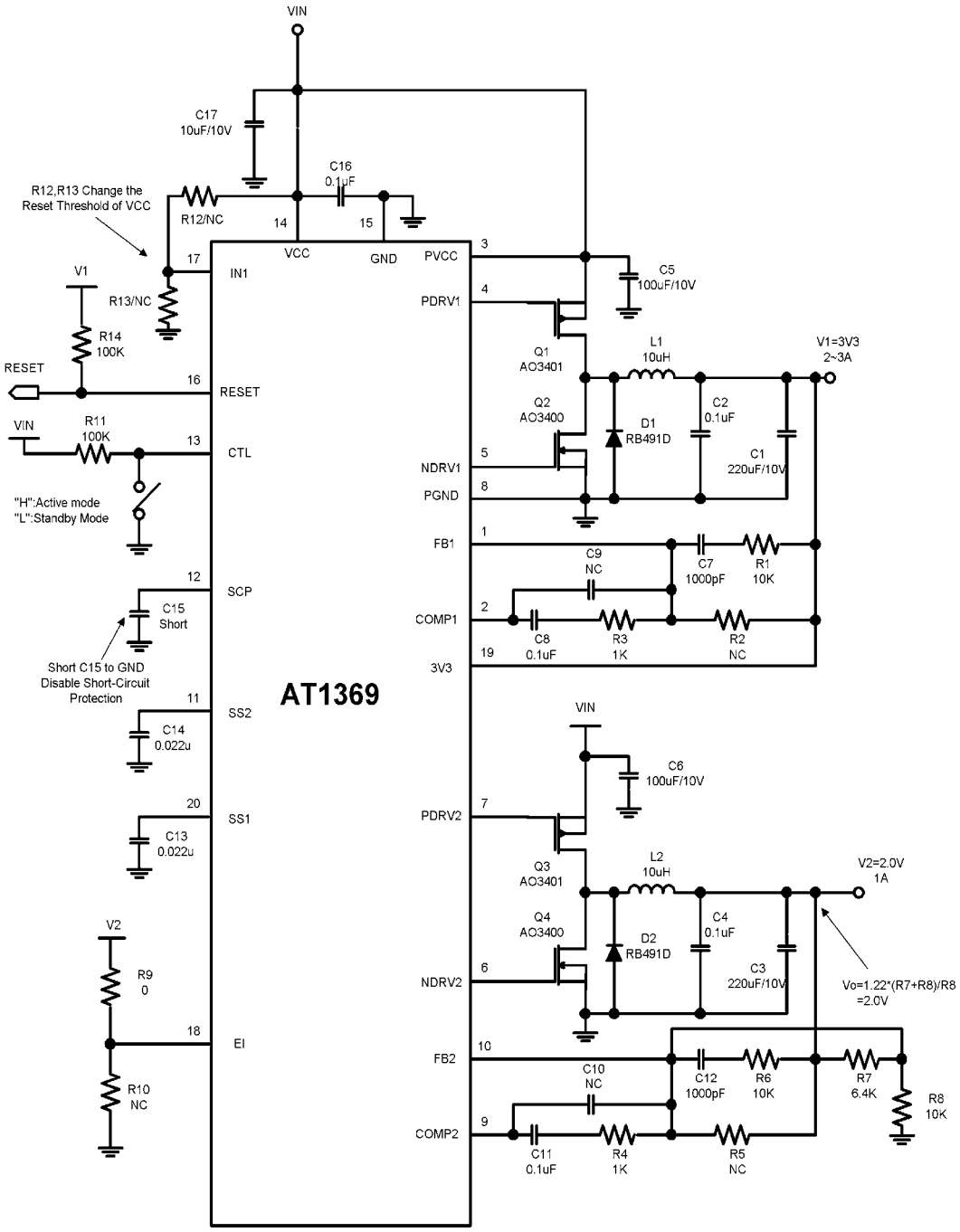
(VCC = 5V,T_a =+25℃ , unless otherwise noted.)

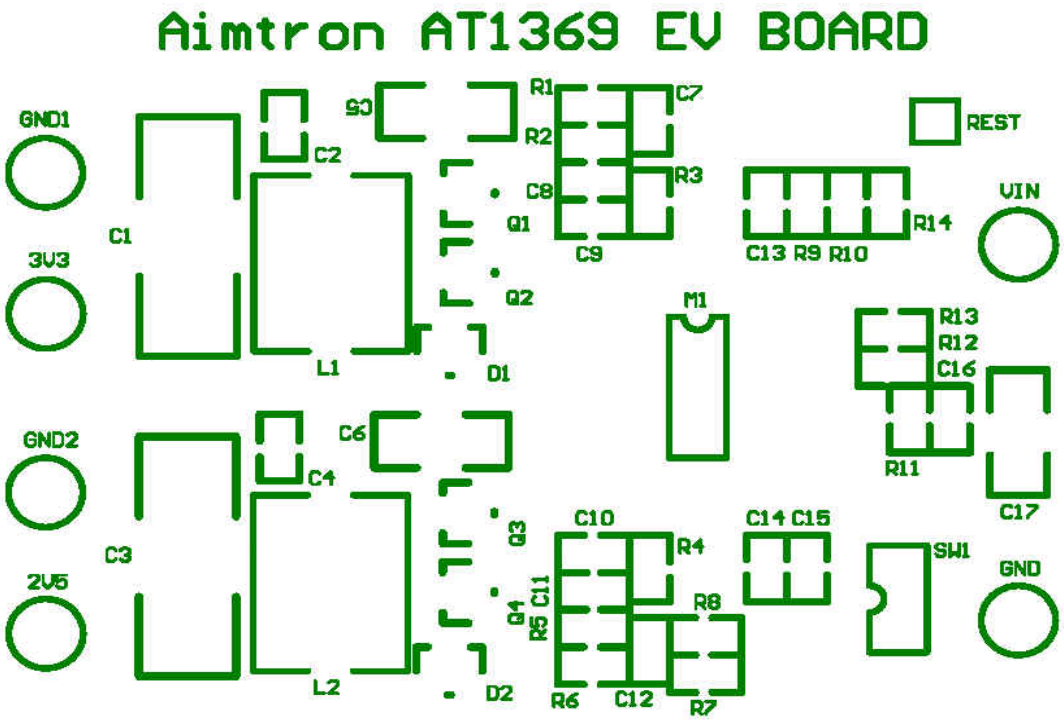
Parameter		Symbol	Condition	Values			Unit
				Min.	Typ.	Max.	
Entire device	Input Supply Range	V_{CC}		2.5	--	7.0	V
	Quiescent Current	I_{CC}	Duty=50%, f_{OSC}=600KHz PDRV/NDRV No Load		1.5	2.0	mA
	Current in standby mode	I_{ST}	CTL=0V			10	μA
	Reference Voltage	V_{REF}	T_a =-20℃ to +85℃	1.20	1.22	1.24	V
	Reference Voltage line-regulation	$V_{REF-Line}$	VCC=2.5V to 7.0V		1	10	mV
	Rference Variation with Temperature		T_a =-20℃ to +85℃		0.5	1.5	%
Error amplifier	Input Offset Voltage	V_{IO}				10	mV
	Source Current	I_{OH}	V_{COMP} = V_{REF} -0.5V	-1.0	-1.5	-2.0	mA
	Sink Current	I_{OL}	V_{COMP} = 0.5V	160	120	80	μA
	Source current Variation with temperature		T_a =-20℃ to +85℃			20	%
	Sink current Variation with temperature		T_a =-20℃ to +85℃			20	%
	Unity Gain Bandwidth	f_T			10.0		MHz
	Common Mode Input Voltage Range	V_{COM}		0.2		1.5	V
	DC Open Loop Gain	A_V			110		dB
Sawtooth wave oscillator (OSC)	Frequency	fosc	AT1369A	250	300	350	KHz
		fosc	AT1369B	500	600	700	KHz
	High Level Voltage				1.0		V
	Low Level Voltage				0.5		V
	Variation with Power Supply		Vcc=2.5V to 7V			2	%
	Variation with temperature		T_a =-20℃ to +85℃			7	%
Soft-Start	Charge Current of SS1,2	$I_{CSS1,2}$		-1.5	-1.0	-0.8	μA
	Invalid threshold voltage of SS1,2				1.0		V
Short-Circuit	Charge Current of SCP	I_{CSCP}		-1.7	-1.25	-1.0	μA
	Threshold Voltage of SCP				0.9		V

PDRV1,2 Output Block	Output source current	I_{source}	Duty≥95% PDRV=0V	-	-130	-80	mA
	Output sink current	I_{sink}	Duty≤5% PDRV=5V	65	100		mA
	Output ON resistor	R_{OH}	PDRV=-15mA		10	20	Ω
		R_{OL}	PDRV=15mA		10	20	Ω
NDRV1,2 Output Block	Output source current	I_{source}	Duty≥95% NDRV=0V	-	-130	-80	mA
	Output sink current	I_{sink}	Duty≤5% NDRV=5V	65	100		mA
	Output ON resistor	R_{OH}	NDRV=-15mA		10	20	Ω
		R_{OL}	NDRV=15mA		10	20	Ω
Control Block	CTL input voltage	V_{IH}	Active mode	VCC-1		VCC	V
		V_{IL}	Standby mode	0		VCC/2	V
	CTL input Current	I_{CTL}	CTL=5.0V			20	μA
RESET Monitor Block	VCC reset ON voltage	V_{RSTON1}		4.10	4.20	4.30	V
	VCC reset hysteresis	$V_{RSTON1\ hys}$		-100		100	mV
	3V3 reset ON voltage	V_{RSTON2}		2.94	3.0	3.06	V
	3V3 reset hysteresis	$V_{RSTON2\ hys}$		-60		60	mV
	EI reset ON voltage	V_{RSTON3}		1.12	1.22	1.32	V
	EI reset hysteresi	$V_{RSTON\ hys}$		-100	-	100	MV
	Reset output voltage	V_{OL}	I_L =1mA			0.4	V
	Reset leakage current	I_{Leak}				2.0	μA



Typical Application Circuit: 3V3 and 2V Output





CH1:PDRV2 CH2:NDRV2 CH3:Output 2.0V/1A(AC ripple)

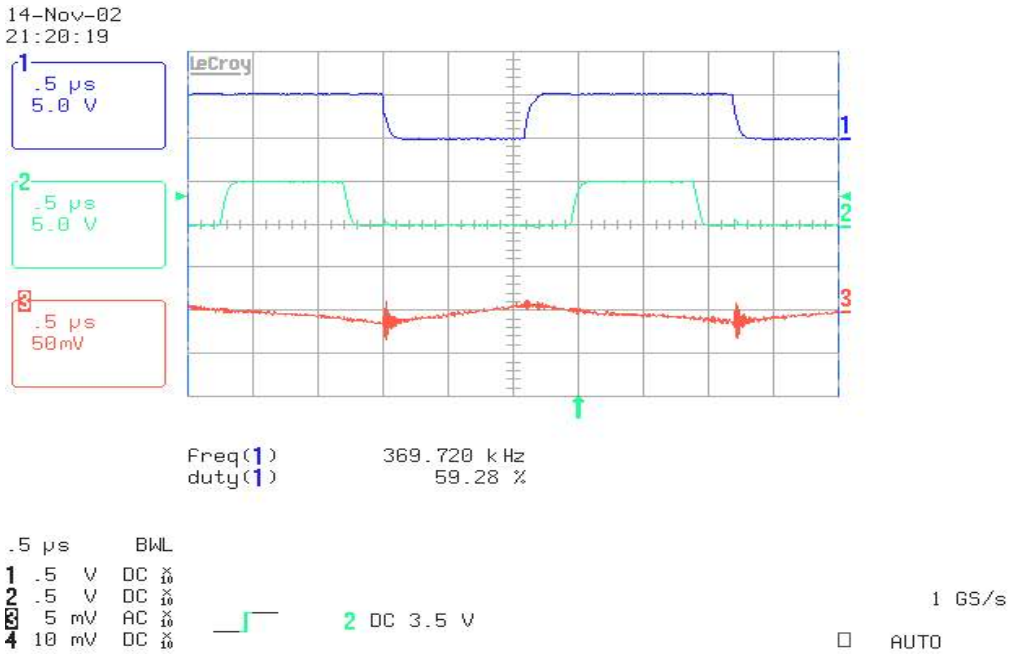


Fig1. Input 5V, Output 2.0V/1A

CH1:PDRV1 CH2:NDRV1 CH3:Output 3.3V/2A(AC ripple)

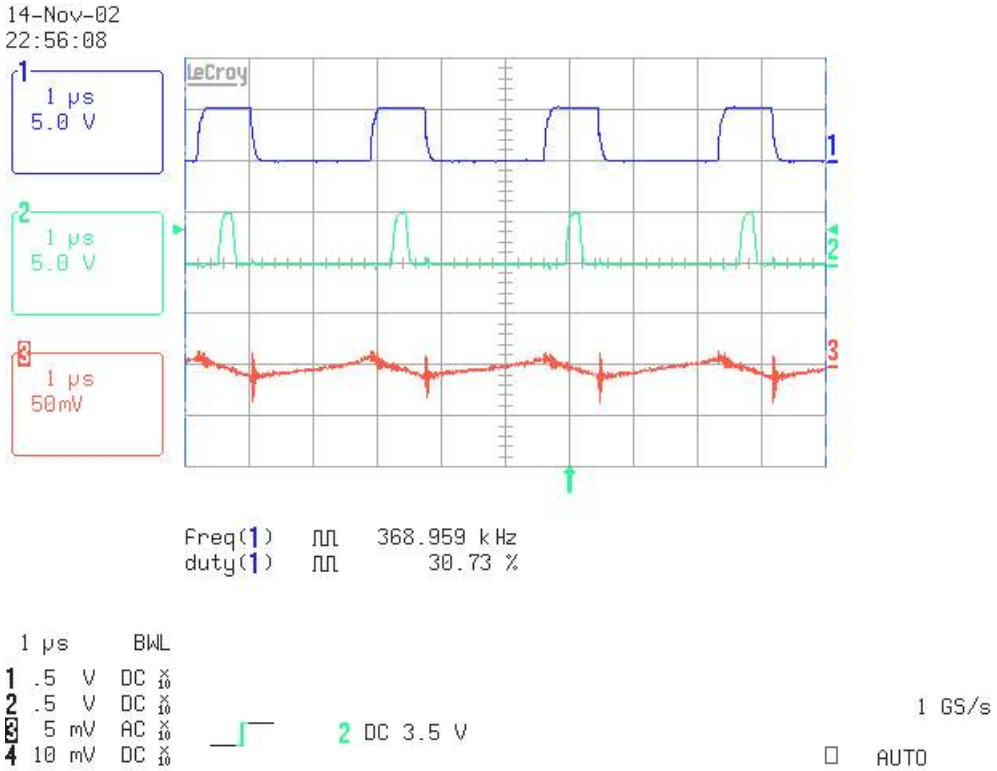
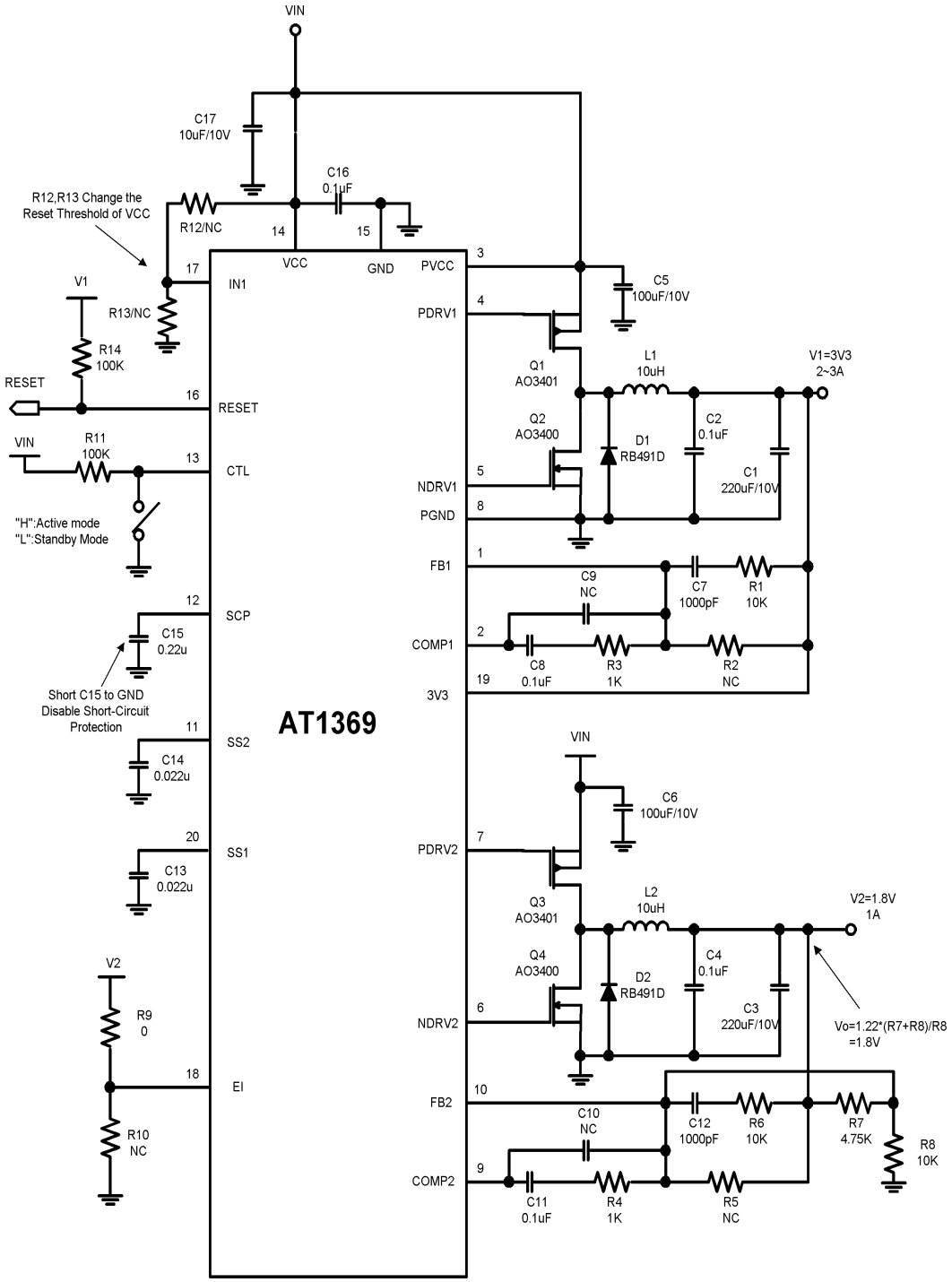
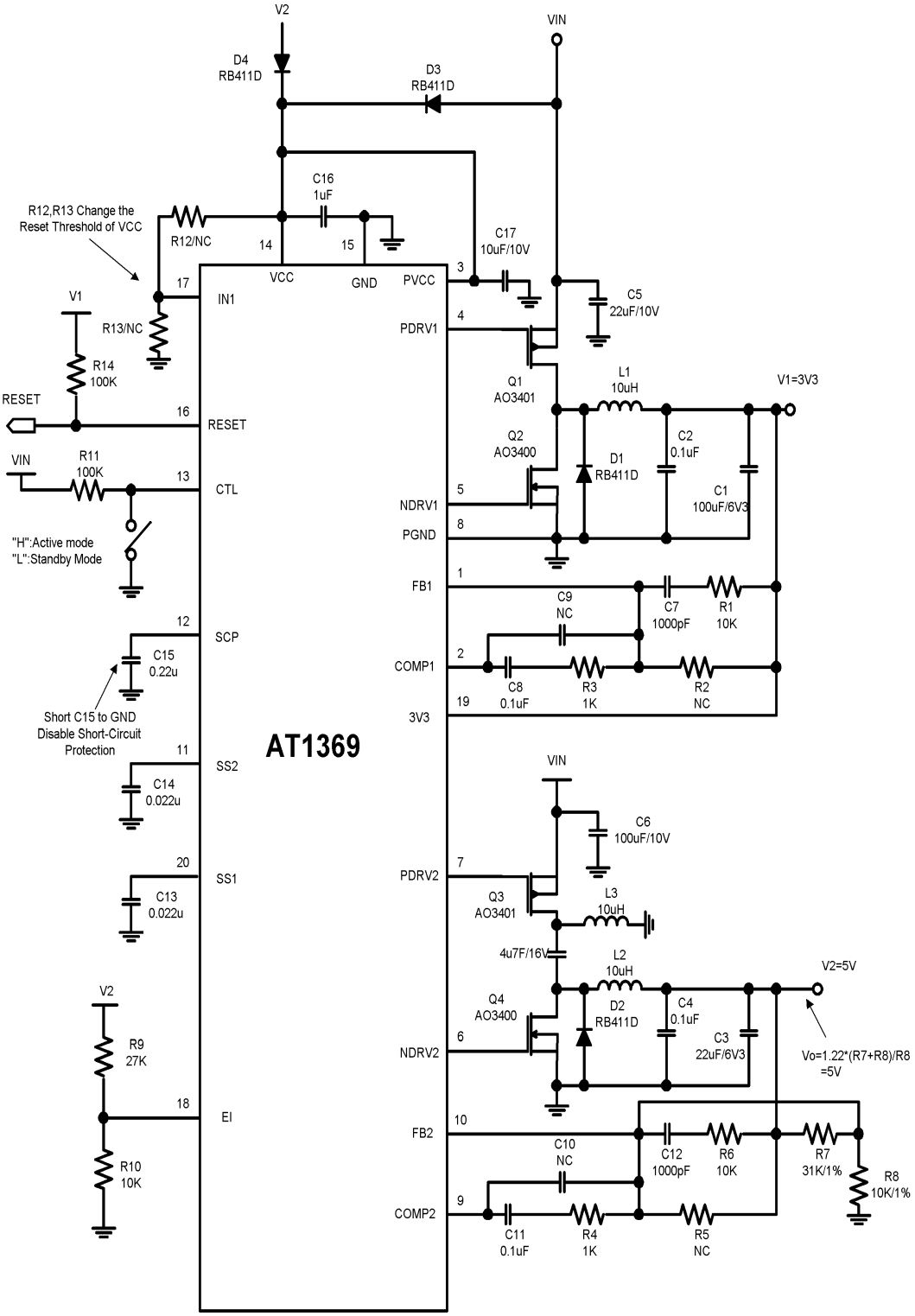


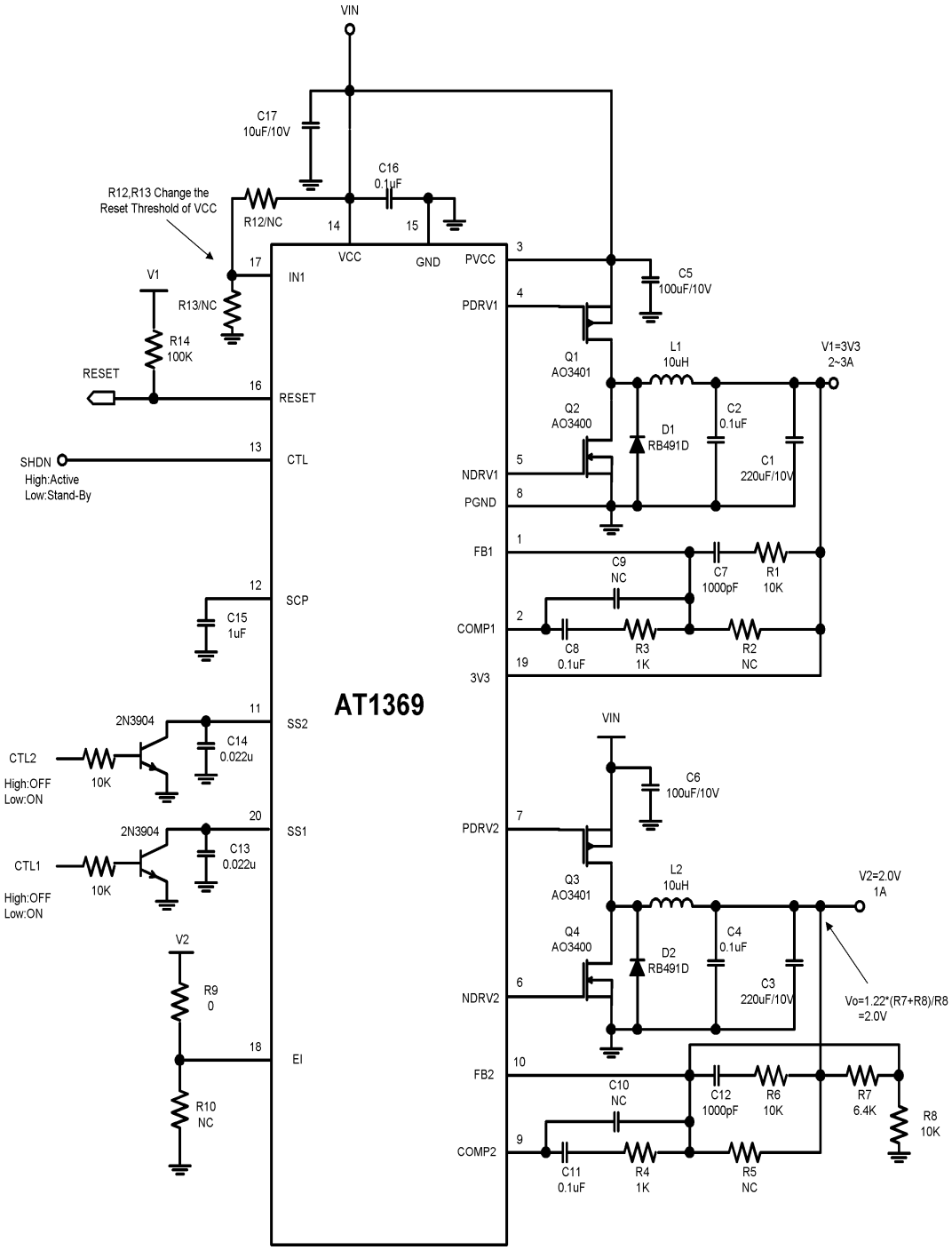
Fig2. Input 5V, Output 3.3V/2A


VIN
C17
10uF/10V
C16
0.1uF
R12,R13 Change the
Reset Threshold of VCC
R12/NC
14
15
VCC
GND
17
IN1
V1
R13/NC
R14
100K
RESET
16
RESET
VIN
R11
100K
13
CTL
"H":Active mode
"L":Standby Mode
12
SCP
C15
0.22u
Short C15 to GND
Disable Short-Circuit
Protection
11
SS2
C14
0.022u
20
SS1
C13
0.022u
V2
R9
0
18
EI
R10
NC
AT1369
PVCC
3
PDRV1
4
C5
100uF/10V
Q1
AO3401
L1
10uH
V1=3V3
2~3A
Q2
AO3400
D1
RB491D
C2
0.1uF
C1
220uF/10V
NDRV1
5
PGND
8
FB1
1
C9
NC
C7
1000pF
R1
10K
COMP1
2
C8
0.1uF
R3
1K
R2
NC
3V3
19
VIN
C6
100uF/10V
PDRV2
7
Q3
AO3401
L2
10uH
V2=1.8V
1A
Q4
AO3400
D2
RB491D
C4
0.1uF
C3
220uF/10V
NDRV2
6
Vo=1.22*(R7+R8)/R8
=1.8V
FB2
10
C10
NC
C12
1000pF
R6
10K
R7
4.75K
R8
10K
COMP2
9
C11
0.1uF
R4
1K
R5
NC

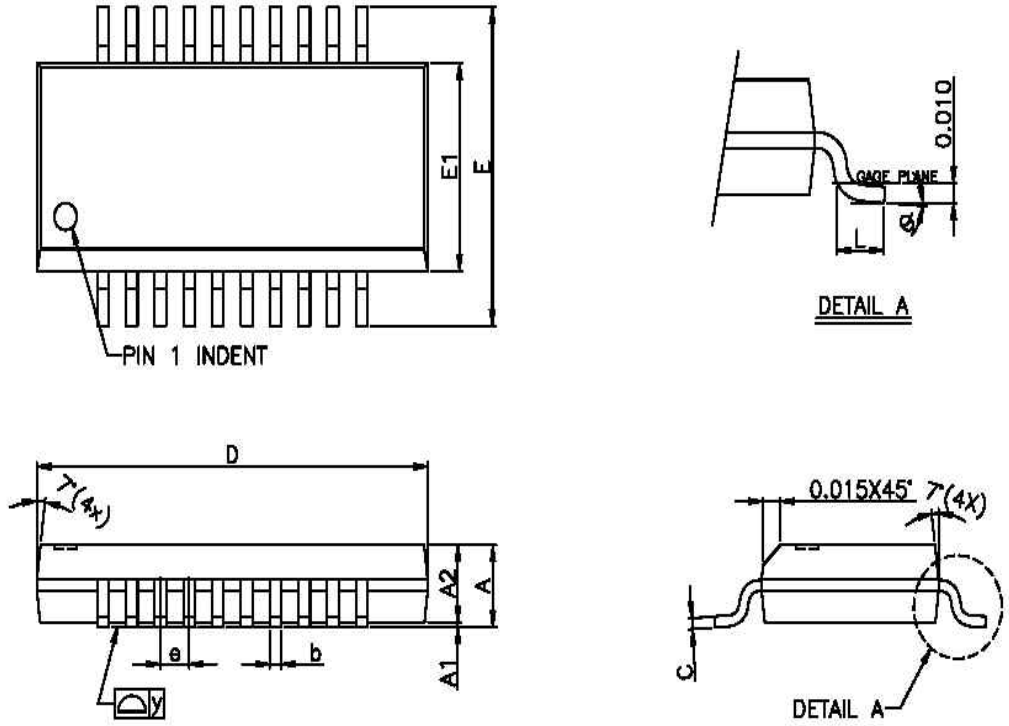


Vin=4 cell AA Battery

How to control CH1 and CH2 ON/OFF:



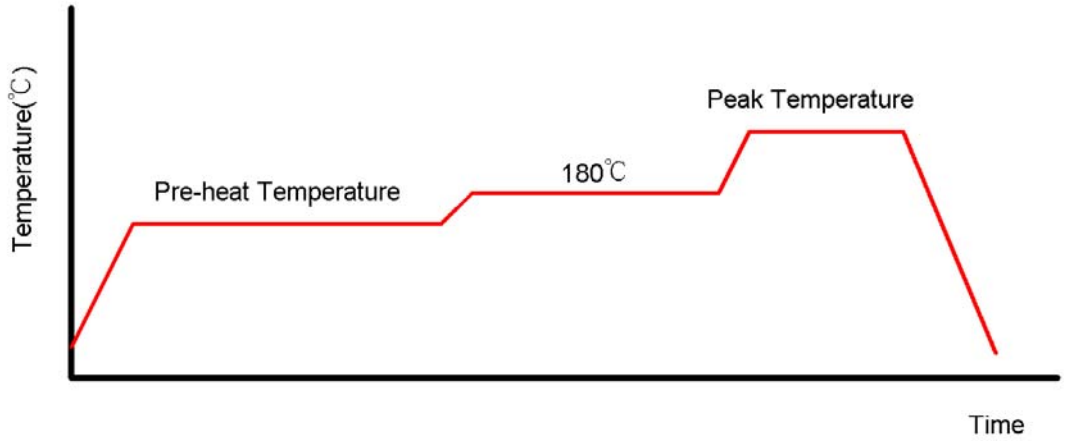
Package Outline 20-pin SSOP



SYMBOL	MILLIMETERS		
	MIN	TYP	MAX
A	1.35	1.63	1.75
A1	0.10	0.15	0.25
A2	-	-	1.50
b	0.20	-	0.30
C	0.18	-	0.25
D	8.56	8.66	8.74
E	5.79	5.99	6.20
E1	3.81	3.91	3.99
L	0.41	0.635	1.27
e	-	0.635	-
y	-	-	0.076
θ	0°		8°

Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A



Classification Reflow Profiles

	Convection or IR/Convction	VPR
Average Heating Rate(180°C to peak)	5°C/second max.	10°C/second max.
Preheat Temperature(125±20°C)	120 seconds max.	
Temperature maintained above 180°C	10~150 seconds	
Time within 5°C of actual Peak Temperature	10~20 seconds	60 seconds
Peak Temperature Range(Note 1)	219~225°C or 235~240°C	219~225°C or 235~240°C
Cooling Rate	6°C /second max.	10°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	

*1 The maximum peak temperatures for IR and VP reflow are depending on package dimensions.

Package Reflow Conditions

Pkg. Thickness ≥2.5mm and all bags	Pkg. Thickness <2.5mm and Pkg. Volume ≥350 mm^3	Pkg. Thickness <2.5mm and Pkg. Volume <350 mm^3
Convection 219~225℃		Convection 235~240℃
VPR 219~225℃		VPR 235~240℃
IR/Convection 219~225℃		IR/Convection 235~240℃