AT1729

Preliminary

3-Channel PWM Controller for LCD Bias

Features

- Low input voltage: 2.5V to 7V
- 3-Channels PWM Control:
  2 Boost Controller(CH1,CH2)
  1 Inverting Controller (CH3)
- Adjustable Soft start time and maximum duty cycle
- Built-in timer latch for short circuit protection:
  Delay time=216/(Switching frequency)
- Built-in under-voltage lockout, thermal shutdown.
- High operating frequency: 100kHz to 1MHz

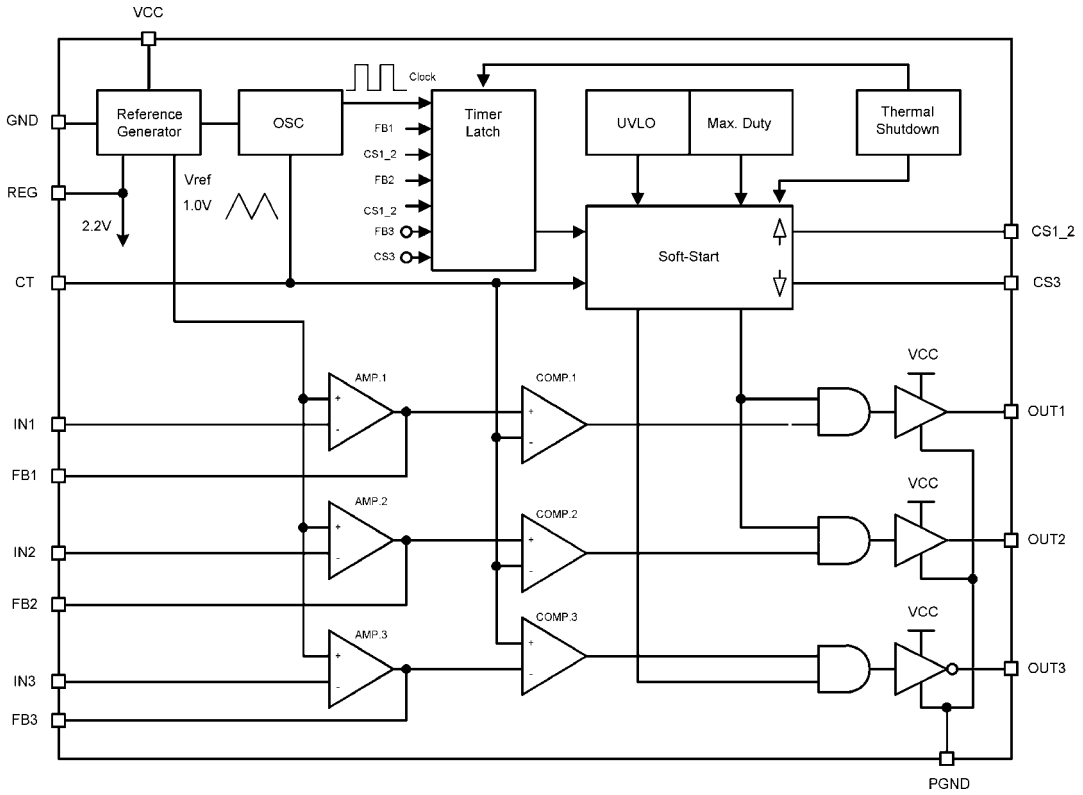
Applications

- LCD Displays Bias
- Power Supply for general equipment

General Description

The AT1729 is a PWM DC/DC converter control IC with 3 channel outputs that can directly drive power MOSFET. This IC ia suitable for very small DC/DC converters because of their small and thin package(1.1 mm max.), and high operation frequency (up to 1.0 MHz).

Block Diagram



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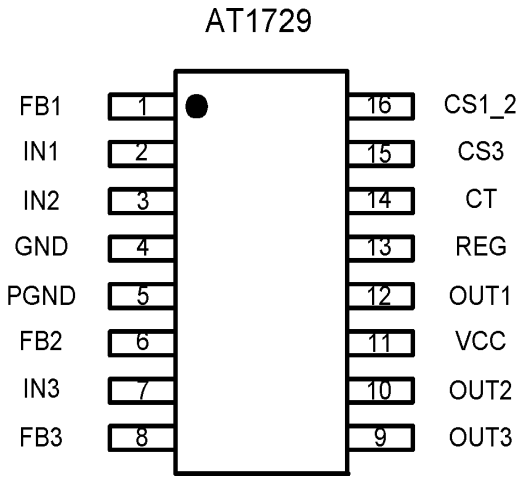
Pin Configuration



Ordering Information

Part number	Package	Marking
AT1729	**TSSOP16**	**-**

Pin Description

Symbol	Pin No.(A/B)	Descript	Symbol	Pin No.(A/B)	Descript
FB1	1	CH1 error amplifier output	**OUT3**	9	CH3 output for Pch-MOSFET
IN1	2	CH1 inverting input to error amplifier	**OUT2**	10	CH2 output for Nch-MOSFET
IN2	3	CH2 inverting input to error amplifier	**VCC**	11	Power Supply
GND	4	Control blocks ground	**OUT1**	12	CH1 output for Nch-MOSFET
PGND	5	Power blocks ground	**REG**	13	Regulated voltage output
FB2	6	CH2 error amplifier output	**CT**	14	Oscillator timing capacitor
IN3	7	CH3 inverting input to error amplifier	**CS3**	15	Sotf-start for CH3
FB3	8	CH3 error amplifier output	**CS1_2**	16	Soft-star for CH1/2

Absolute Maximum Ratings

Parameter	Condition	Rated Value		Unit
		Min.	Max.	
Power Supply Voltage	—	-	+8	V
Source Average Current of OUT1 OUT2, OUT3	—	-	-50	mA
Sink Average Current of OUT1 OUT2, OUT3	—	-	50	mA
Input Voltage to Error Amplifier	—	-	6.5	V
Continuous power dissipation	TSSOP16（T_a=+25℃）	-	500	mW
Operating temperature	—	-30	+85	^{0}C
Junction temperature	—	-	+125	^{0}C
Storage temperature	—	-40	+150	^{0}C
Lead temperature	—	-	+300	^{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
Oscillation frequency	f_{OSC}	100	500	1000	KHz
Operating temperature	T_{OP}	-30	+25	+85	°C

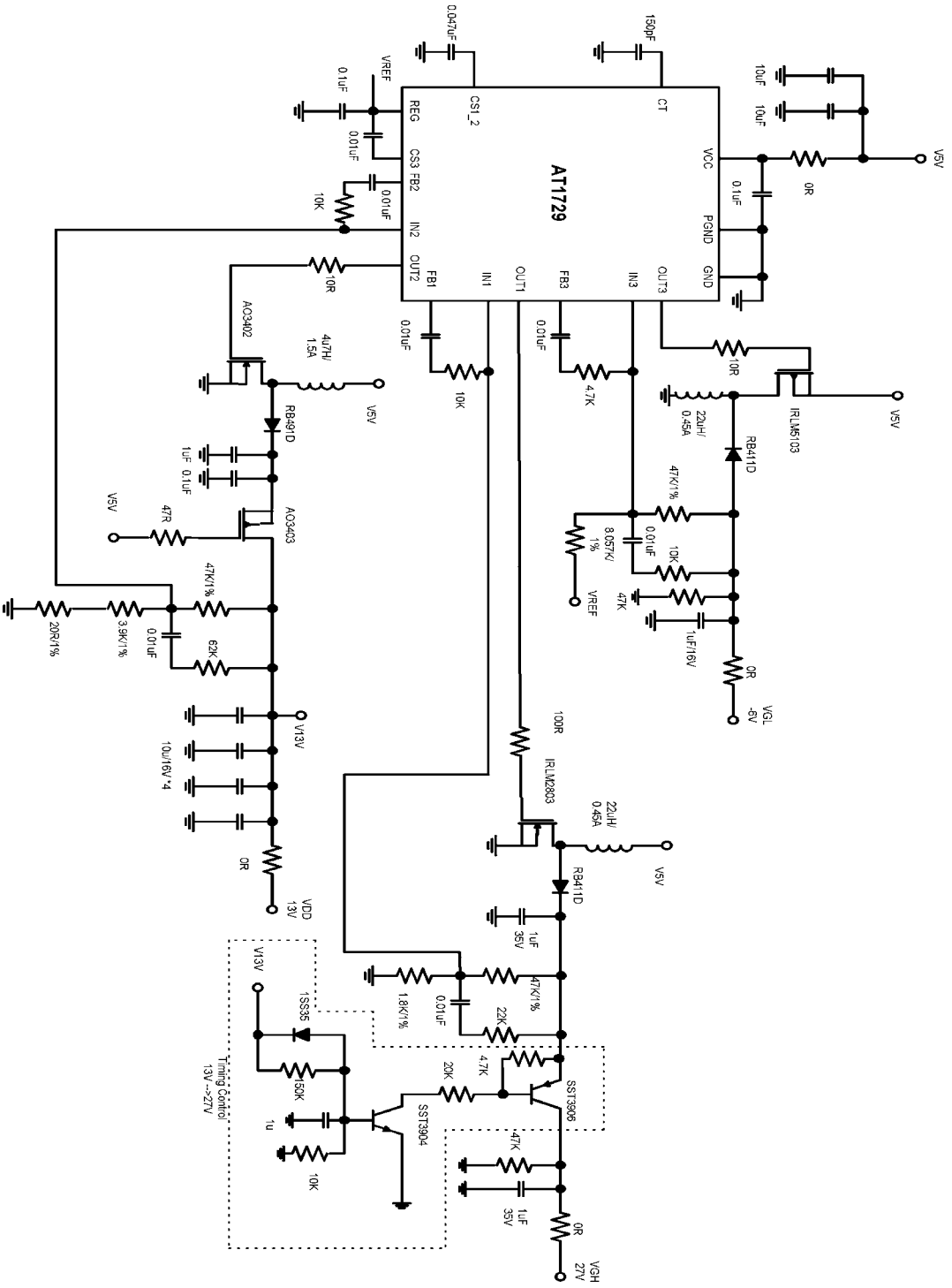
Electrical Characteristics

(VCC = 3V, T_a =+25℃, unless otherwise noted.)

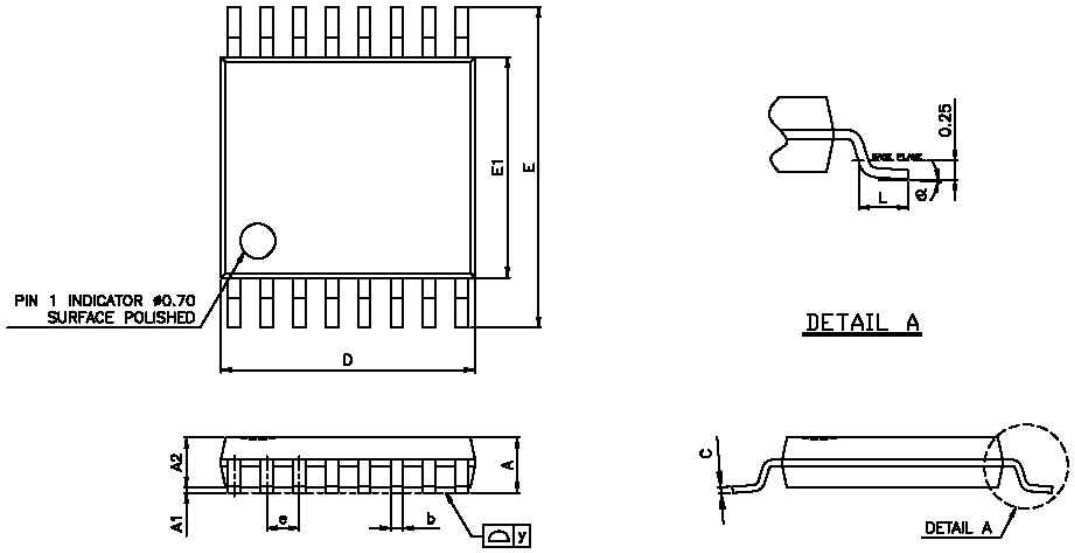
Parameter		Symbol	Condition	Values			Unit
				Min.	Typ.	Max.	
Entire device	Input Supply Range	V_{CC}		2.5	--	7.0	V
	VCC Undervoltage Lockout	UVLO		1.95	2.05	2.15	V
	Reference Voltage	V_{REF}		0.98	1.00	1.02	V
	Reference Voltage line-regulation	$V_{REF-Line}$	VCC=2.5V to 7.0V		1	5	mV
	Rference Variation with Temperature		T_a =-30℃ to +85℃		0.5	1.5	%
	Operating Current	I_{CC}	Duty=50%, f_{OSC}=500KHz		3.0	3.8	mA
Error amplifier	Input Offset Voltage	V_{IO}				10	mV
	Source Current (CH1,2,3)	I_{OH}	V_{FB} = V_{REG} -0.5V	-160	-120	-80	μA
	Sink Current(CH1,2,3)	I_{OL}	V_{FB} = 0.5V	2.0	2.5	3.0	mA
	Source current Variation with temperature		T_a =-30℃ to +85℃			20	%
	Sink current Variation with temperature		T_a =-30℃ to +85℃			20	%
	Unity Gain Bandwidth	f_T			2.0		MHz
	Common Mode Input Voltage Range	V_{COM}		0.2		1.5	V
	DC Open Loop Gain	A_V			80		dB
Sawtooth wave oscillator (OSC)	Frequency	fosc	C_T =150pF	480	550	620	kHz
	High Level Voltage		C_T =150pF		1.0		V
	Low Level Voltage		C_T =150pF		0.5		V
	Variation with Power Supply		Vcc=2.5V to 7V			2	%
	Variation with temperature		T_a =-30℃ to +85℃			7	%
Regulated Voltage for internal Control Block	Regulated Voltage	V_{REG}	C_O =0.1 μF	2.16	2.20	2.24	V
	Variation with Power Supply		Vcc=2.5V to 7V			1.5	%
	Variation with Temperature		T_a =-30℃ to +85℃			1.5	%
	Source Current	I_{REG}		-40	-	-15	mA

Soft-Start and Duty Section	Charge Current of CS1_2(Source)	I_{CS1_2}			-1.0		mA
	Charge Current of CS3(Sink)	I_{CS3}			1.0		mA
	Max. Duty of CH1,2		f_{OSC}=500KHz	80	87	90	%
	Max. Duty of CH3		f_{OSC}=500KHz	80	86	90	%
	Invalid TL threshold voltage of CS1_2				0.3		V
	Invalid TL threshold voltage of CS3				1.32.		V
Timer Latch Section (TL)	Threshold Voltage of FB1,2	$V_{TLTH1\ 2}$			1.32		V
	Threshold Voltage of FB3	V_{TLTH3}			0.3		V
	Start up count	Count			2^{16}		
	Start up time	T_{TL}		105	119	137	ms
Thermal Shuntdown Section	Threshold Temperature	T_{OH}			140		^{0}C
Output Section	Rise time of OUT1,2	t_{r1_2}	C_O =1000pF between OUT1,2-GND	20	25	35	ns
	Rise time of OUT3	t_{r3}	C_O =1000pF between VCC-OUT3	20	25	35	ns
	Fall time of OUT1,2	t_{f1_2}	C_O =1000pF between OUT1,2-GND	20	25	35	ns
	Fall time of OUT3	t_{f3}	C_O =1000pF between VCC-OUT3	20	25	35	ns
	High Level on Resistance of OUT1,2	R_{1_2AH}	I_{OUT1_2}=-150mA	2.5	4.0	5.5	Ω
	Low Level on Resistance of OUT1,2	R_{1_2AL}	I_{OUT1_2}=150mA	2.5	4.0	5.5	Ω
	High Level on Resistance of OUT3	R_{3AH}	I_{OUT3}=-150mA	2.5	4.0	5.5	Ω
	Low Level on Resistance of OUT3	$R3_{AL}$	I_{OUT1_2}=150mA	2.5	4.0	5.5	Ω

Typical Application Circuit



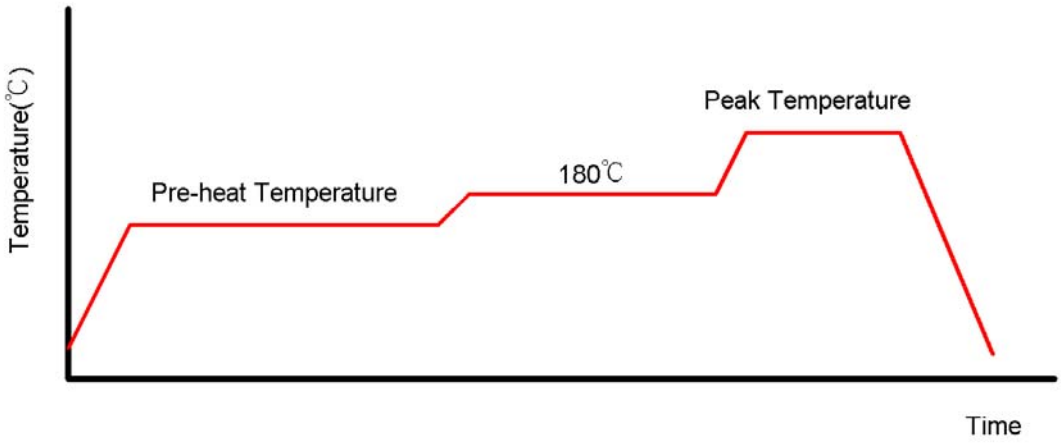
Package Outline 16-pin TSSOP



SYMBOL	MILLIMETERS			INCHES		
	MIN	TYP	MAX	MIN	TYP	MAX
A	1.05	1.10	1.20	0.041	0.043	0.047
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	-	1.00	1.05	-	0.039	0.041
b	0.20	0.25	0.28	0.008	0.010	0.011
C	-	0.127	-	-	0.005	-
D	4.90	5.075	5.10	0.193	0.1998	0.200
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.170	0.173	0.177
L	0.50	0.60	0.70	0.020	0.024	0.028
e	-	0.65	-	-	0.026	-
y	-	-	0.076	-	-	0.003
θ	0°		8°	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℃