



圓創科技股份有限公司

**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= $2^{16}/(\text{Switching frequency})$
- Built-in under-voltage lockout, thermal shutdown.
- High operating frequency: 100kHz to 1MHz

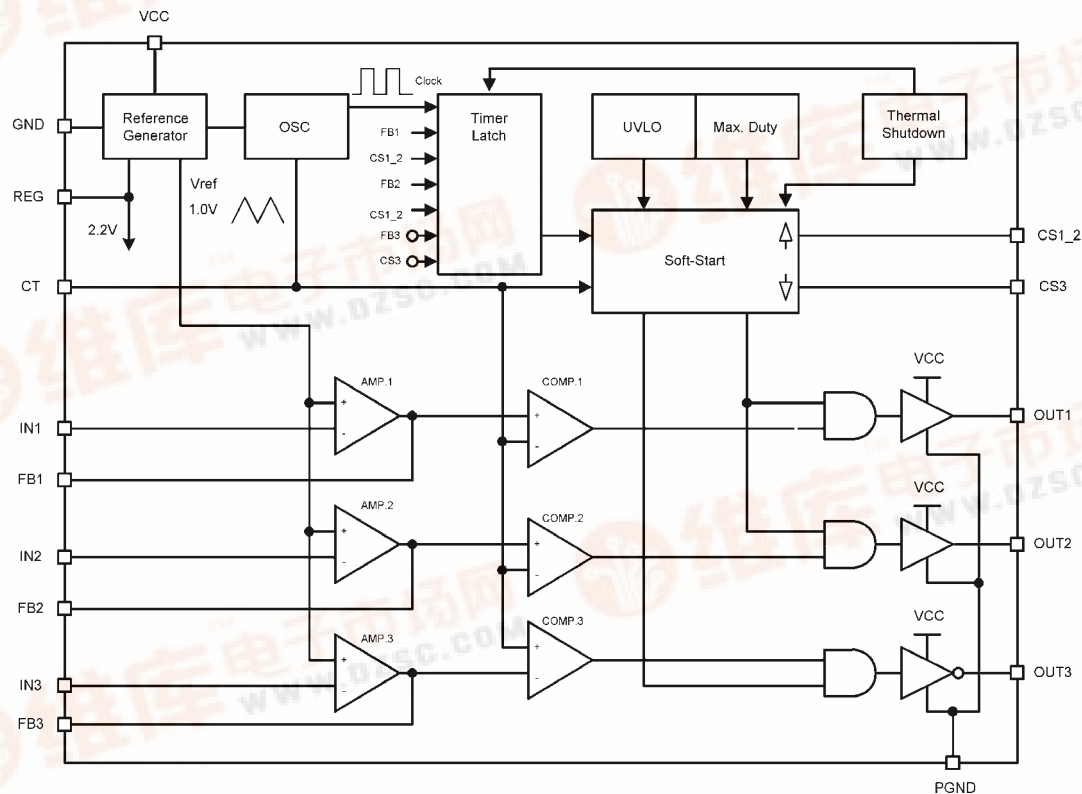
**General Description**

The AT1729 is a PWM DC/DC converter control IC with 3 channel outputs that can directly drive power MOSFET. This IC is 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).

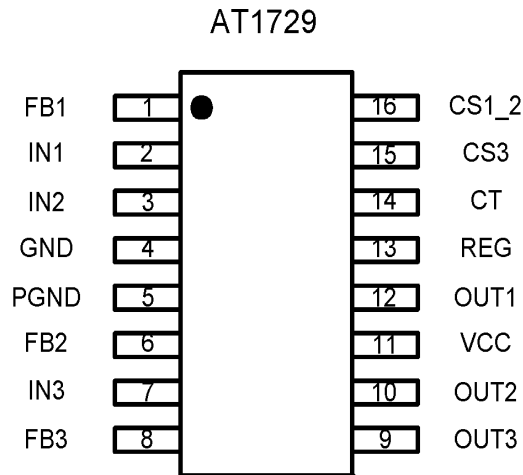
**Applications**

- LCD Displays Bias
- Power Supply for general equipment

**Block Diagram**



**Pin Configuration**



**Ordering Information**

Part number	Package	Marking
AT1729	TSSOP16	-

**Pin Description**

Symbol	Pin No.(A/B)	Descript	Symbol	Pin No.(A/B)	Descript
<b>FB1</b>	1	CH1 error amplifier output	<b>OUT3</b>	9	CH3 output for Pch-MOSFET
<b>IN1</b>	2	CH1 inverting input to error amplifier	<b>OUT2</b>	10	CH2 output for Nch-MOSFET
<b>IN2</b>	3	CH2 inverting input to error amplifier	<b>VCC</b>	11	Power Supply
<b>GND</b>	4	Control blocks ground	<b>OUT1</b>	12	CH1 output for Nch-MOSFET
<b>PGND</b>	5	Power blocks ground	<b>REG</b>	13	Regulated voltage output
<b>FB2</b>	6	CH2 error amplifier output	<b>CT</b>	14	Oscillator timing capacitor
<b>IN3</b>	7	CH3 inverting input to error amplifier	<b>CS3</b>	15	Soft-start for CH3
<b>FB3</b>	8	CH3 error amplifier output	<b>CS1_2</b>	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 ( $T_a=+25^{\circ}\text{C}$ )	-	500	mW
Operating temperature	—	-30	+85	$^{\circ}\text{C}$
Junction temperature	—	-	+125	$^{\circ}\text{C}$
Storage temperature	—	-40	+150	$^{\circ}\text{C}$
Lead temperature	—	-	+300	$^{\circ}\text{C}$

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

( $T_a=+25^{\circ}\text{C}$ )

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	$^{\circ}\text{C}$

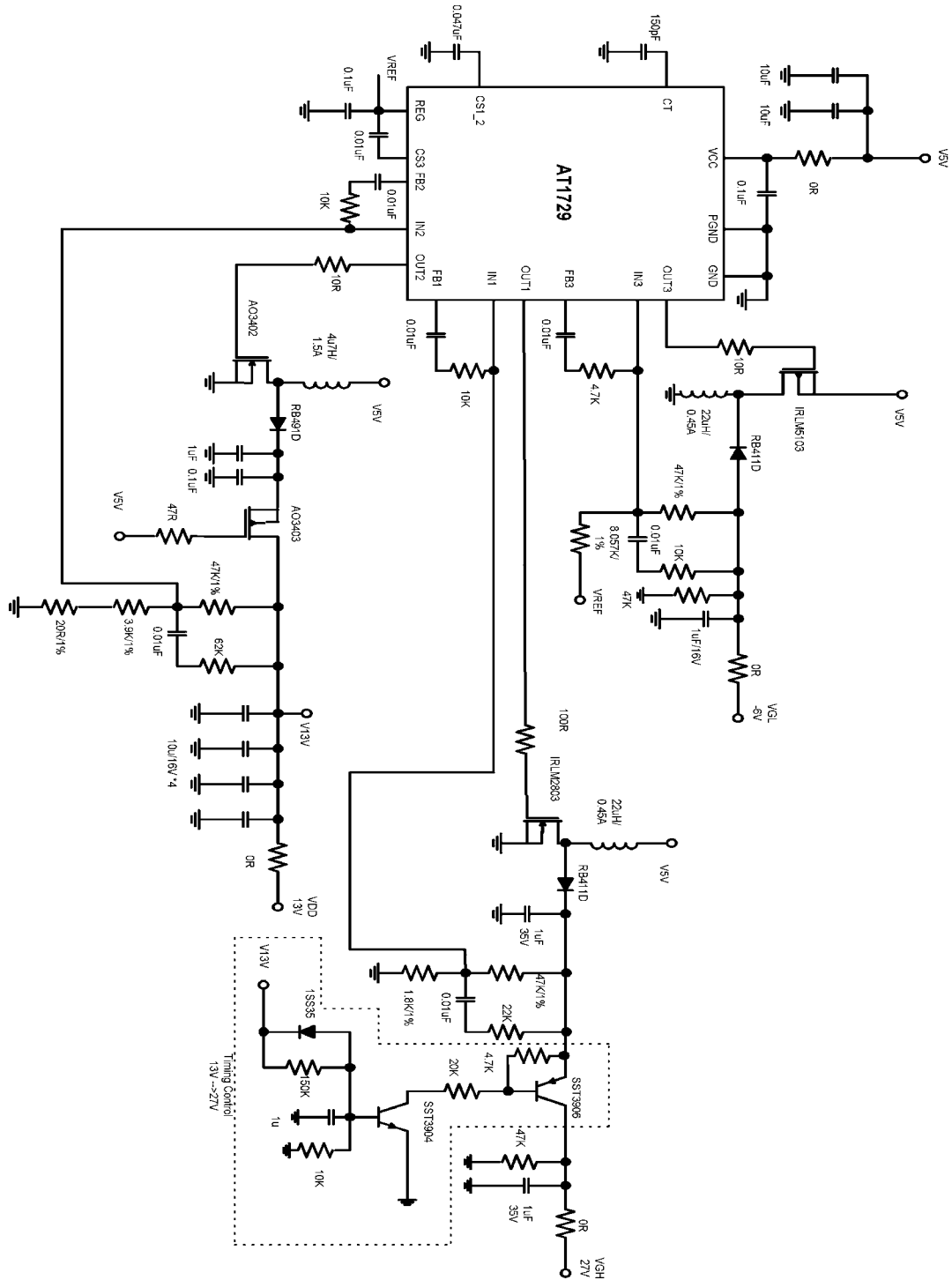
### Electrical Characteristics

(VCC = 3V, T<sub>a</sub> = +25°C, unless otherwise noted.)

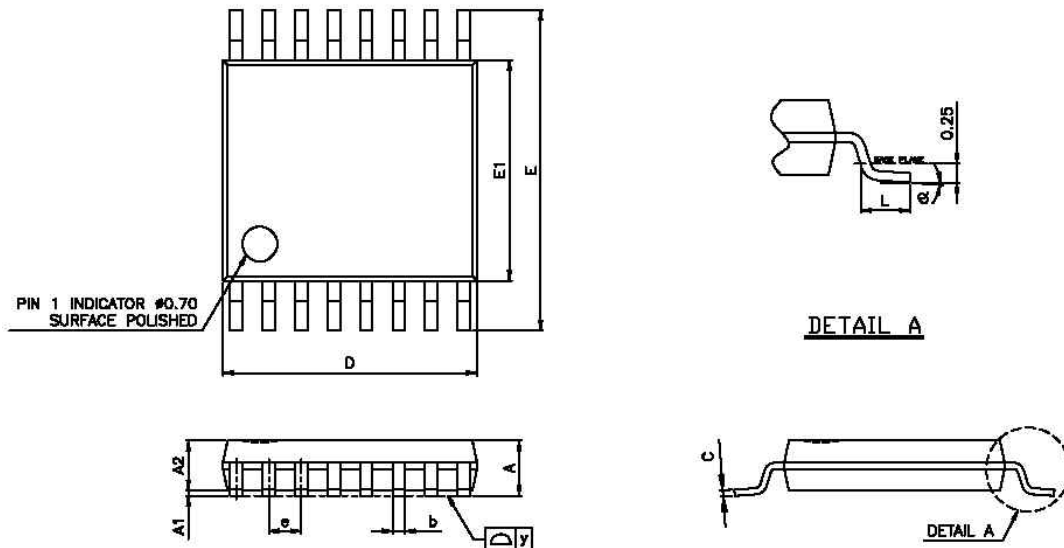
Parameter	Symbol	Condition	Values			Unit	
			Min.	Typ.	Max.		
Entire device	Input Supply Range	V <sub>CC</sub>	2.5	--	7.0	V	
	VCC Undervoltage Lockout	UVLO	1.95	2.05	2.15	V	
	Reference Voltage	V <sub>REF</sub>	0.98	1.00	1.02	V	
	Reference Voltage line-regulation	V <sub>REF-Line</sub>	VCC=2.5V to 7.0V		1	5	mV
	Reference Variation with Temperature		T <sub>a</sub> = -30°C to +85°C		0.5	1.5	%
	Operating Current	I <sub>CC</sub>	Duty=50%, f <sub>OSC</sub> =500KHz		3.0	3.8	mA
Error amplifier	Input Offset Voltage	V <sub>IO</sub>			10	mV	
	Source Current (CH1,2,3)	I <sub>OH</sub>	V <sub>FB</sub> = V <sub>REG</sub> -0.5V	-160	-120	-80	μA
	Sink Current(CH1,2,3)	I <sub>OL</sub>	V <sub>FB</sub> = 0.5V	2.0	2.5	3.0	mA
	Source current Variation with temperature		T <sub>a</sub> = -30°C to +85°C			20	%
	Sink current Variation with temperature		T <sub>a</sub> = -30°C to +85°C			20	%
	Unity Gain Bandwidth	f <sub>T</sub>			2.0		MHz
	Common Mode Input Voltage Range	V <sub>COM</sub>		0.2		1.5	V
	DC Open Loop Gain	A <sub>v</sub>			80		dB
Sawtooth wave oscillator (OSC)	Frequency	f <sub>osc</sub>	C <sub>T</sub> =150pF	480	550	620	kHz
	High Level Voltage		C <sub>T</sub> =150pF		1.0		V
	Low Level Voltage		C <sub>T</sub> =150pF		0.5		V
	Variation with Power Supply		V <sub>CC</sub> =2.5V to 7V			2	%
	Variation with temperature		T <sub>a</sub> = -30°C to +85°C			7	%
Regulated Voltage for internal Control Block	Regulated Voltage	V <sub>REG</sub>	C <sub>O</sub> =0.1 μF	2.16	2.20	2.24	V
	Variation with Power Supply		V <sub>CC</sub> =2.5V to 7V			1.5	%
	Variation with Temperature		T <sub>a</sub> = -30°C to +85°C			1.5	%
	Source Current	I <sub>REG</sub>		-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		$f_{OSC}=500\text{KHz}$	80	87	90	%
	Max. Duty of CH3		$f_{OSC}=500\text{KHz}$	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			216		
	Start up time	$T_{TL}$		105	119	137	ms
Thermal ShUTDOWN Section	Threshold Temperature	$T_{OH}$			140		°C
Output Section	Rise time of OUT1,2	$t_{r1\_2}$	$C_o = 1000\text{pF}$ between OUT1,2-GND	20	25	35	ns
	Rise time of OUT3	$t_r3$	$C_o = 1000\text{pF}$ between VCC-OUT3	20	25	35	ns
	Fall time of OUT1,2	$t_{f1\_2}$	$C_o = 1000\text{pF}$ between OUT1,2-GND	20	25	35	ns
	Fall time of OUT3	$t_f3$	$C_o = 1000\text{pF}$ between VCC-OUT3	20	25	35	ns
	High Level on Resistance of OUT1,2	$R_{1\_2AH}$	$I_{OUT1\_2}=-150\text{mA}$	2.5	4.0	5.5	$\Omega$
	Low Level on Resistance of OUT1,2	$R_{1\_2AL}$	$I_{OUT1\_2}=150\text{mA}$	2.5	4.0	5.5	$\Omega$
	High Level on Resistance of OUT3	$R_{3AH}$	$I_{OUT3}=-150\text{mA}$	2.5	4.0	5.5	$\Omega$
	Low Level on Resistance of OUT3	$R_{3AL}$	$I_{OUT1\_2}=150\text{mA}$	2.5	4.0	5.5	$\Omega$

**Typical Application Circuit**



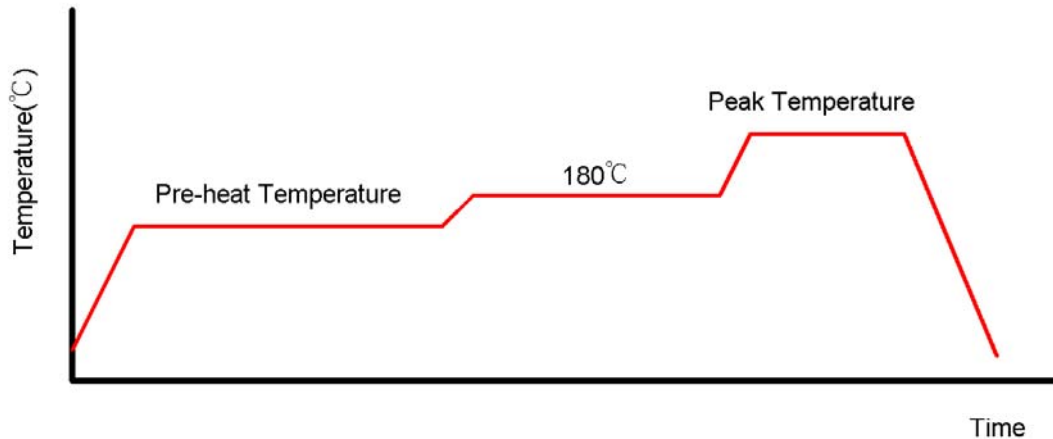
**Package Outline 16-pin TSSOP**



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/Convection	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 <sup>3</sup>	Pkg. Thickness <2.5mm and Pkg. Volume <350 mm <sup>3</sup>
Convection 219~225°C		Convection 235~240°C
VPR 219~225°C		VPR 235~240°C
IR/Convection 219~225°C		IR/Convection 235~240°C