DESCRIPTION

The A7430 consists of step-down switching regulator with PWM control. These devises include a reference voltage source, oscillation circuit, error amplifier, internal PMOS and etc.

A7430 provides low-ripple power, high efficiency and external transient characteristics. The PWM control circuit is able to the duty ratio linearly from 0 up to 100%.The converter is build out soft start function that prevents overshoot and inrush current at startup. An over current protect function and short circuit protect function are built inside, and when OCP or SCP happens, the operation frequency will be reduced. The operating frequency is decided by outside resistance. An external compensation is easily to system stable.

With the addition of an internal P-channel Power MOS, a coil, capacitors, and a diode connected externally, these ICs can function as step-down switching regulators. They serve as ideal power supply units for portable devices when coupled with the PSOP8 with exposed pad package, providing such outstanding features as low current consumption. Since this converter can accommodate an input voltage up to 40V, it is also suitable for the operation via an AC adapter.

The A7430 is available in PSOP8 package.

FEATURES

- Input voltage : 4.2V to 40V
- Output voltage : 0.8V to 38V
- Duty ratio : 0% to 100% PWM control
- Oscillation frequency range is 50K to 600KHz by outside resistance setting
- Current limit, Short Circuit Protect (SCP) and Thermal Shutdown protection
- Built-in internal SW P-channel MOS
- Available in PSOP8 Package

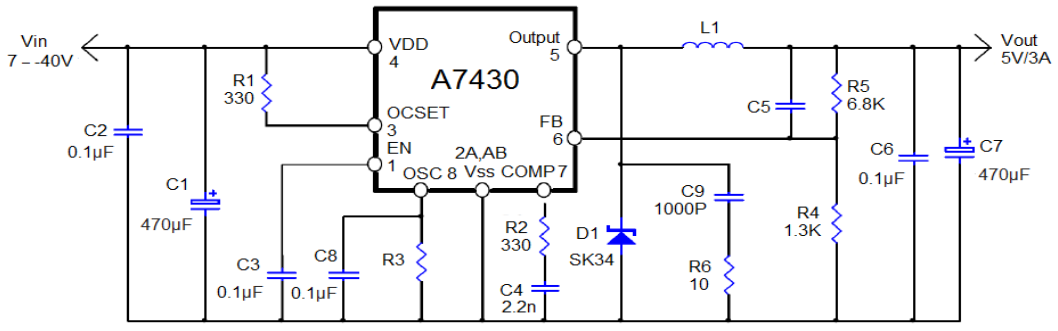
APPLICATION

- Portable DVD Players
- Car Application
- Telecom/Networking Equipment
- Set Top Boxes

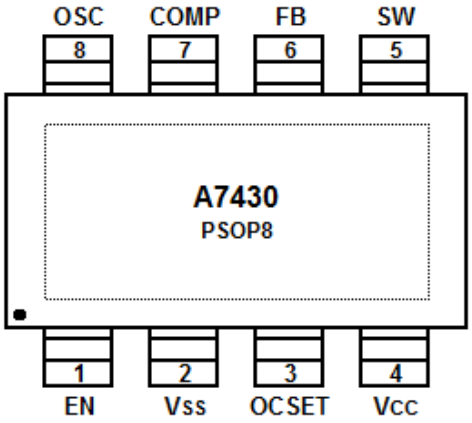
ORDERING INFORMATION

Package Type	Part Number	
PSOP8	MP8	A7430MP8R
		A7430MP8VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products Suffix " V " means Halogen free Package		

TYPICAL APPLICATION



PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1	EN	Enable control input. Drive high to turn on the converter, low to turn it off. For automatic startup, leave EN unconnected.
2	V_{SS}	Power GND.
3	OCSET	Add an external resister to set max. Output current.
4	V_{CC}	Power supply.
5	SW	Switch pin. Connect external inductor & diode here.
6	FB	Feedback voltage to internal error amplifier, the threshold voltage is 0.8V
7	COMP	Compensation Node. COMP is used to compensate the regulation control loop. Connect a series RC network from COMP to GND to compensate the regulation control loop.
8	OSC	Frequency Set Pin. The pin connect a resistance to GND.

ABSOLUTE MAXIMUM RATINGS

T_A=25°C, Unless Otherwise Noted

V_{CC}, Supply Voltage	V_{SS}-0.3V to V_{SS}+42V
V_{FB}, Feedback Voltage	V_{SS} -0.3V to 6V
$V_{EN/SS}$, EN pin Voltage	V_{SS} -0.3V to 6V
V_{OSC}, OSC pin Voltage	V_{SS} -0.3V to 6V
V_{COMP}, COMP pin Voltage	V_{SS} -0.3V to 6V
V_{OCSET}, OCSETMP pin Voltage	V_{SS} -0.3V to 6V
V_{SW}, Switch pin Voltage	V_{SS} -0.3V to V_{CC}+0.3V
T_{ST}, Storage Temperature Range	-65℃ to 150℃
T_{OJP}, Operation Junction Temperature Range	-40℃ to 125℃
V_{OP}, Operation Supply Voltage	4.2V to 40V
θ_{JA}, Thermal Resistance (Junction to Ambient)	90℃/W
θ_{JC}, Thermal Resistance (Junction to Case)	15℃/W
T_{STG}, Soldering Temperature	300℃ , 5sec

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

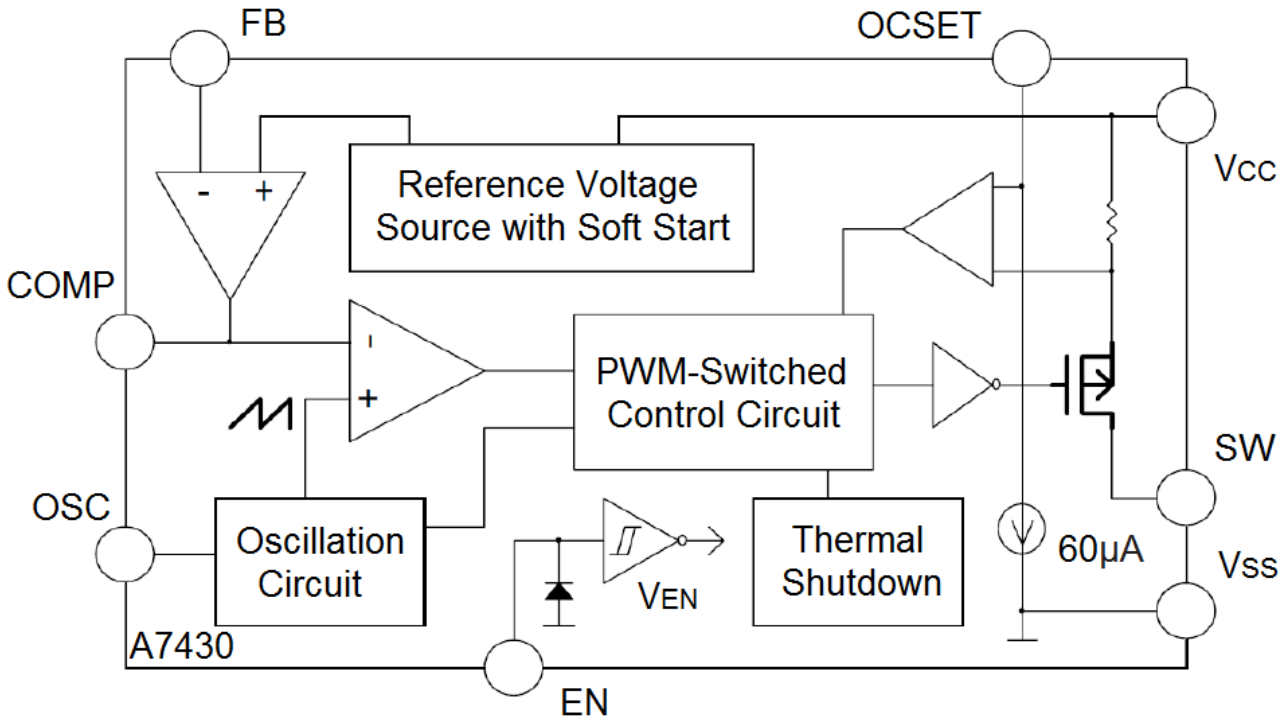
NOTE1: θ_{JA} is measured with the PCB copper area (need connect to Exposed PAD) of approximately 1.5 in^2(Multi-layer).

ELECTRICAL CHARACTERISTICS

V_{CC} =12V, T_A =25°C, unless otherwise noted

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Feedback Voltage	V_{FB}	V_{CC}=10V to 30V, I_{OUT}=0 to 2A T_J=20℃ to 125℃	0.784	0.800	0.816	V
Quiescent Current	I_Q	V_{FB}=1.2V force driver off		3	6	mA
Feedback Bias Current	I_{FB}	I_{OUT}=0.1A		0.1	0.5	μA
Shutdown Supply Current	I_{SD}	$V_{EN/SS}$=0V		150	300	μA
Switch Current	I_{SW}		3.5			A
Adjustable frequency	F_{OSC}		50		600	KHz
Short frequency	F_{OSC}/F_{OSC}		5	6		KHz
EN pin Shutdown logic input threshold voltage	V_{ENL}				0.8	V
Internal MOSFET On-state Resistance	R_{DSON}	V_{CC}=12V, V_{OUT}=5V, I_{OUT}=2A		130	180	mΩ
Efficiency	η	V_{CC}=12V, V_{OUT}=5V, I_{OUT}=2A		91		%
		V_{CC}=30V, V_{OUT}=5V, I_{OUT}=2A		86		

BLOCK DIAGRAM



DETAILED INFORMATION

EN

This pin can be supplied shutdown function. It is inside pull high function. For normal application, the pin must be connected a capacitor to ground. Allow the switching regulator circuit to be shutdown pulling this pin below a 0.8V threshold voltage; the shutdown supply current is approximately 150uA.

OSC

External frequency set pin. The pin connects a resistance (R3) to reduce system frequency. This converter's frequency can be set from 50K to 600KHz. Please refer the below table to set frequency.

R3	510K	220K	100K	56K	36K	27K	20K
Frequency	47KHz	100KHz	200KHz	300KHz	400Kz	500KHz	600KHz

COMP

Compensation pin. For EL output capacitor application, the COMP pin connects R2 and C4 to ground for all condition.

OCSET

The current limit threshold is setting by the external resister connecting from V_{CC} supply to OCSET. The internal 60uA sink current crossing the resistor sets the voltage at pin of OCSET. When the V_S voltage is less than the voltage at OCSET, an over-current condition is triggered.

Application Information

Setting the Output Voltage

Application circuit item shows the basic application circuit with adjustable output version. The external resistor sets the output voltage according to the following equation:

Table 1 Resistor select for output voltage setting

V_{OUT}	R4	R5
5V	1.3K	6.8K
3.3V	1.5K	4.7K
2.5V	2.2K	4.7K
1.8V	2K	2.5K
1.5V	2.2K	2K
1.2V	2K	1K

Inductor Selection

For most designs, the different frequency can be reducing the inductor value; The A7430 is suggested 15μH for 50K to 600KHz frequency. Please refer the below table to design.

L1 recommend value (V_{IN} = 8~40V, V_{OUT} = 5V, I_{OUT} = 3A)				
Frequency (Hz)	300KHz~600KHz	200KHz~300KHz	100KHz~200KHz	50KHz~100KHz
L1 Value (μH)	10uH~22uH	22uH~47uH	33uH~68uH	68uH~160uH

Where is inductor Ripple Current. Large value inductor lower ripple current and small value inductor result in high ripple current. Choose inductor ripple current approximately 20% of the maximum load current 3A, ΔI_L=0.6A. The DC current rating of the inductor should be at least equal to the maximum load current plus half the ripple current to prevent core saturation (3+0.3A)

Input Capacitor Selection

The capacitor should be located close to the IC using shout leads and the voltage rating should be approximately 1.5 times the maximum input voltage. The RMS current rating requirement for the input capacitor of a buck regulator is approximately 1/2 the DC load current. A low ESR capacitor sized for maximum RMS current must be used. A 470uF low ESR capacitor for most application is sufficient.

Output Capacitor Selection

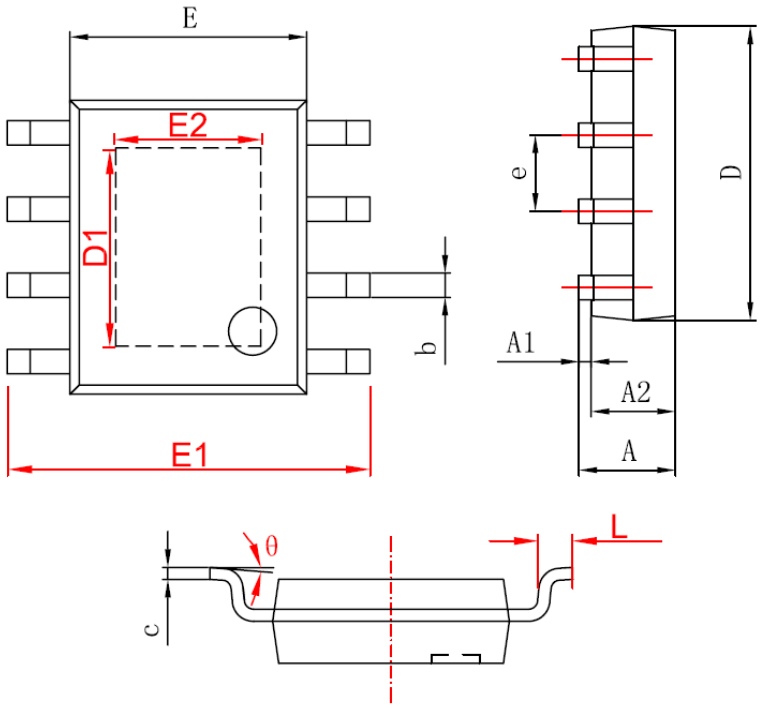
The output capacitor is required to filter the output provide regulator loop stability. The important capacitor parameters are; the 100KHz Equivalent Series Resistance (ESR), the RMS ripples current rating, voltage rating, and capacitor value. For the output capacitor, the ESR value is the most important parameter. The ESR can be calculated from the following formula.

$$V_{RIPPLE}=\Delta I_L \times ESR=0.6A\times 80m\Omega=48mV$$

An aluminum electrolytic capacitor's ESR value is related to the capacitance and its voltage rating. In most case, higher voltage electrolytic capacitors have lower ESR values. Most of the time, capacitors with mush higher voltage ratings may be needed to provide the low ESR values required for low output ripple. It is recommended to replace this low ESR capacitor by using a 470uF low ESR values < 80mΩ.

PACKAGE INFORMATION

Dimension in PSOP8 Package (Unit: mm)



Symbol	Min	Max
A	1.350	1.750
A1	0.050	0.150
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.700	5.100
D1	3.202	3.402
E	3.800	4.000
E1	5.800	6.200
E2	2.313	2.513
e	1.270(BSC)	
L	0.400	1.270
θ	0°	8°

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