DESCRIPTION

The A7142 series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving 2A load with excellent line and load regulation. These devices are available in fixed output voltages of 5V and an adjustable output versions.

Requiring a minimum number of external components, these regulators are simple to use and include internal frequency compensation, and a fixed-frequency oscillator. The A7142 series operates at a switching frequency of 150KHz thus allowing smaller sized filter components than what would be needed with lower frequency switching regulators.

Some features include a guaranteed ±4% tolerance on output voltage under specified input voltage and output load conditions, and ±15% on the oscillator frequency. External shutdown is included, featuring typically 50μA standby current. The output switch includes cycle-by-cycle current limiting, as well as thermal shutdown for full protection under fault conditions. The oscillator frequency reduces in the event of an output short or an overload which causes the regulated output voltage to drop approximately 40% from the nominal output voltage.

The A7142 is available in SOP8 and PSOP8 packages.

FEATURES

- 5V and adjustable output versions
- Adjustable version output voltage range, 1.23V to 37V ± 3% max over line and load conditions
- Guaranteed 2A output current
- Wide input voltage range
- Requires only 4 external components
- 150 kHz fixed frequency oscillator
- TTL shutdown capability, low power standby mode
- Uses readily available standard inductors
- Thermal shutdown and current limit protection

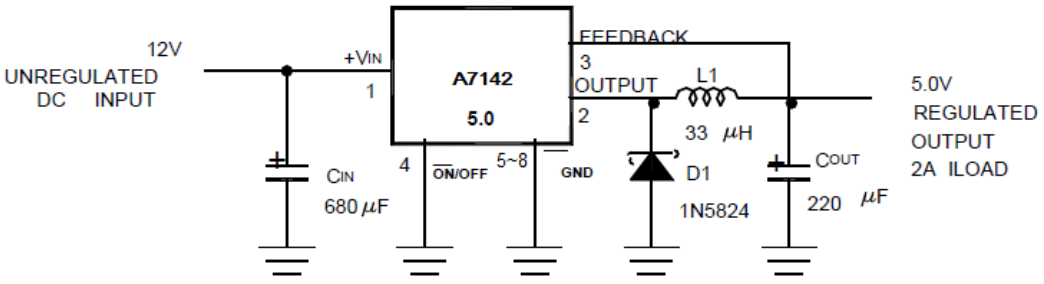
APPLICATION

- Simple high-efficiency step-down (buck) regulator
- On-card switching regulators
- Positive to negative converter

ORDERING INFORMATION

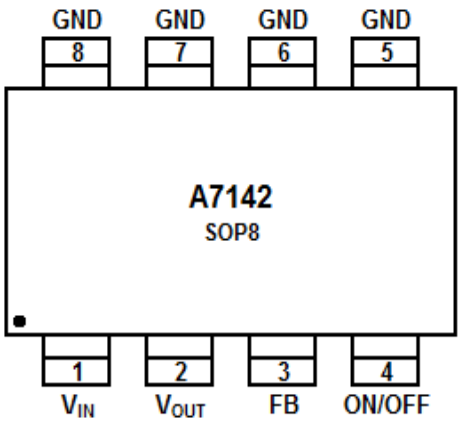
Package Type	Part Number	
SOP8 SPQ: 2,500pcs/Reel	M8	A7142M8R-XX
		A7142M8VR-XX
PSOP8 SPQ: 2,500pcs/Reel	MP8	A7142MP8R-XX
		A7142MP8VR-XX
Note	XX: Output Voltage; 50=5.0V; ADJ=Adjustable V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products Suffix "V" means Halogen free Package		

TYPICAL APPLICATION

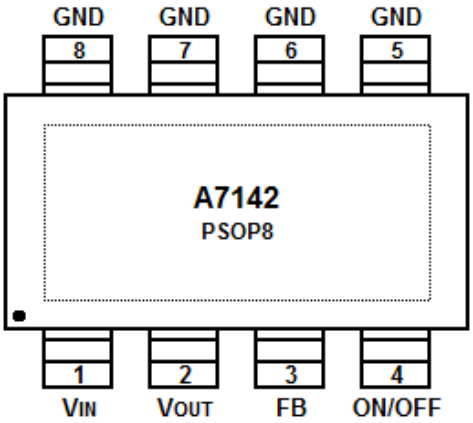


Fixed Output Voltage Versions

PIN DESCRIPTION



Top View



Top View

Pin #	Symbol	Function
1	V_{IN}	Input Voltage Pin
2	V_{OUT}	Output Voltage Pin
3	FB	Feed Back
4	ON/OFF	Enable Pin
5,6,7,8	GND	Ground Pin

ABSOLUTE MAXIMUM RATINGS

Maximum Supply Voltage	45V
$\overline{ON}$/OFF Pin Input Voltage	$-0.3V \le V \le +V_{IN}$
FB Pin Voltage	$-0.3V \le V \le +V_{IN}$
Output Voltage to Ground	-0.8V
Power Dissipation	Internally Limited
Storage Temperature Range	-65 °C to +150 °C
Maximum Junction Temperature	150 °C
Minimum ESD Rating (C= 100pF, R = 1.5 kΩ)	2kV

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.

RECOMMENDED OPERATING CONDITIONS

Temperature Range	$-40°C \le T_J \le +125$ °C
Max Supply Voltage	40V
I_{LOAD}	2A

ELECTRICAL CHARACTERISTICS NOTE1

V_{IN}= 12V Unless otherwise specified

Parameter	Symbol	Conditions			Min.	Typ.	Max.	Unit
System Parameters (Test Circuit Figure 1)								
Output Voltage	V_{OUT}	7V ≤ V_{IN} ≤ 40V, 0.2A ≤ I_{LOAD} ≤ 2A	(NOTE7)	5.0V	4.800 4.750	5.0	5.200 5.250	V
		7V ≤ V_{IN} ≤ 40V, 0.2A ≤ I_{LOAD} ≤ 2A V_{OUT} programmed for 5V	(NOTE7)	ADJ	1.193 1.180	1.230	1.267 1.280	V
	η	V_{IN} =12V, I_{LOAD} =2A		5.0V		77		%
		V_{IN} =12V, I_{LOAD} =2A V_{OUT} programmed for 5V		ADJ		77		%
All Output Voltage Versions								
Feedback Bias Current	I_{FB}	V_{OUT} =5V (Adjustable Version Only)	(NOTE7)			50	100 500	nA
Oscillator Frequency	F_O	(NOTE6)	(NOTE7)		130 120	150	170 180	kHz
Saturation Voltage	V_{SAT}	I_{OUT} =2A (NOTE2)	(NOTE7)			1.2	1.4 1.6	V
Max Duty Cycle (ON)	DC	(NOTE3)			93	98		%
Current Limit	I_{CL}	Peak Current (NOTE2, 6)	(NOTE7)		2.5 2.3	3.2	4.6 5.2	A
Output Leakage Current	I_{OL}	(NOTE4, 5): Output = 0V Output = -0.8V				0.4 10	2 30	mA
Quiescent Current	I_Q	(NOTE 4)				5	10	mA
Standby Quiescent Current	I_{STBY}	ON/OFF Pin = 5V (OFF)				60	200	uA
ON/OFF Control								
ON/OFF Pin Logic Input Level	V_{IH}	V_{OUT}=0V	(NOTE7)		2.2 2.4	1.4		V
	V_{IL}	V_{OUT}=Nominal Output Voltage	(NOTE7)			1.2	1.0 0.8	V
ON/OFF Pin Input Current	I_{IH}	ON/OFF Pin = 5V (OFF)				12	30	uA
	I_{IL}	ON/OFF Pin = 0V (ON)				0	10	uA

NOTE1: External components such as the catch diode, inductor, input and output capacitors can affect switching regulator system performance.

NOTE2: Output pin sourcing current. No diode, inductor or capacitor connected to output.

NOTE3: Feedback pin removed from output and connected to 0V.

NOTE4: Feedback pin removed from output and connected to +12V for the adjustable and 5V, versions to force the output transistor OFF

NOTE5: V_{IN} =40V.

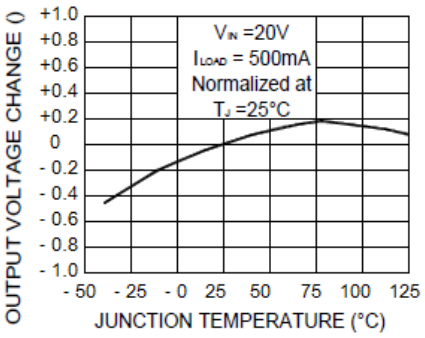
NOTE6: The oscillator frequency reduces to approximately 36 kHz in the event of an output short or an overload which causes the regulated output voltage to drop approximately 40% from the nominal output voltage. This self protections feature lowers the average power dissipation of the IC by lowering the minimum duty cycle from 5% down to approximately 2%.

NOTE7: denotes the specifications which apply over full operating temperature range T_J = -40…+125°C.

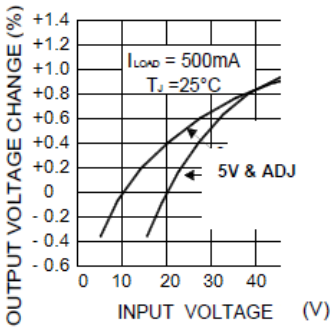
TYPICAL PERFORMANCE CHARACTERISTICS (Circuit of Figure 1)

Figure 1.

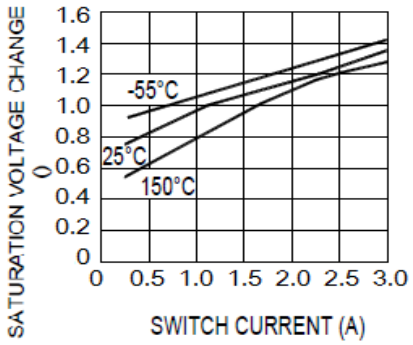
1. Normalized Output Voltage



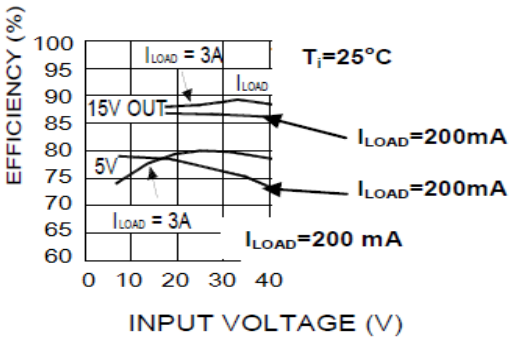
2. Line Regulation



3. Switch Saturation Voltage



4. Efficiency



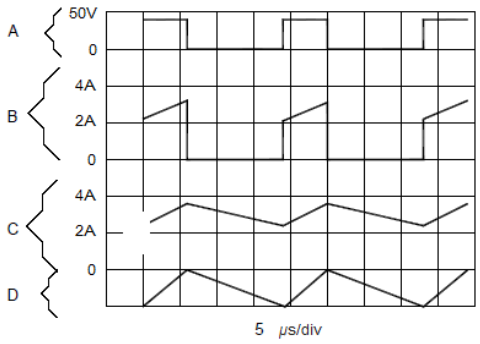
5. Switching Waveforms ,V_{OUT} =15V,

A: Output Pin Voltage, 50V/div,

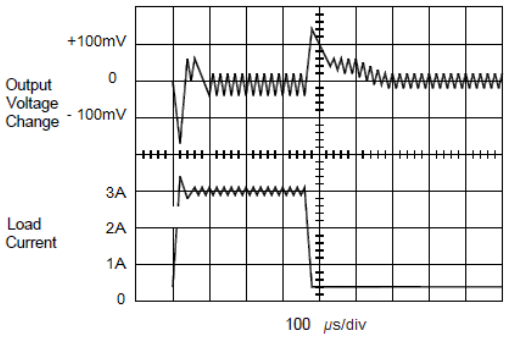
B: Output Pin Current 2A/div,

C: Inductor Current 2A/div,

D: Output Ripple Voltage 50mv/div

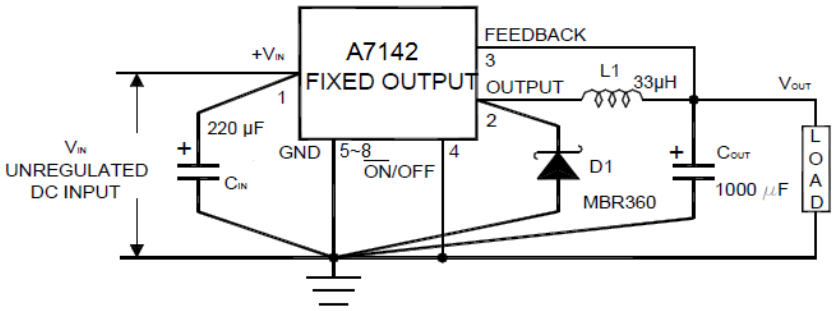


6. Load Transient



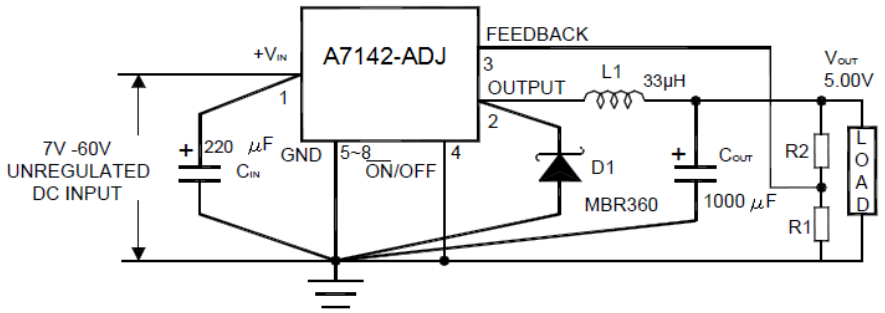
TEST CIRCUIT

1. Fixed Output Voltage Versions



C_{IN} — 220uF, 75V, Aluminum Electrolytic
C_{OUT} —1000µF, 25V, Aluminum Electrolytic
D1 — Schottky, MBR360
L_1 — 33uH, Pulse Eng. PE-92108
R_1 — 2k, 0.1%
R_2 — 6.12k, 0.1%

2. Adjustable Output Voltage Version

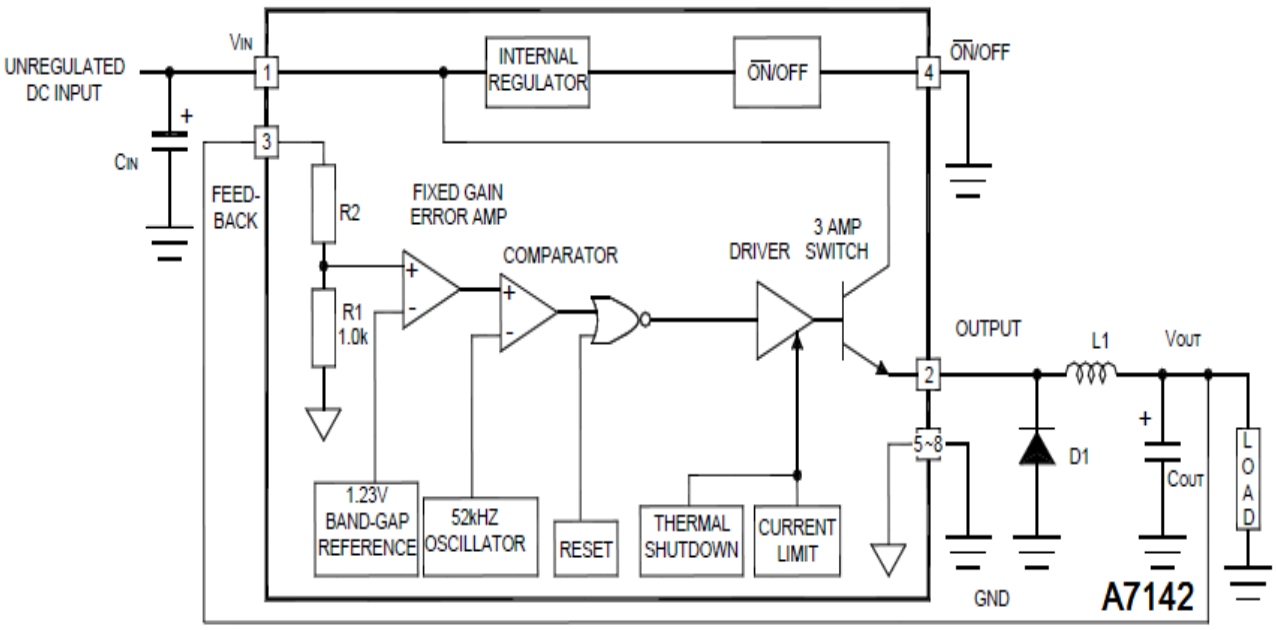


$$V_{OUT} = V_{REF}(1+\frac{R_2}{R_1})$$

$$R_2 = R_1(\frac{V_{OUT}}{V_{REF}} - 1)$$

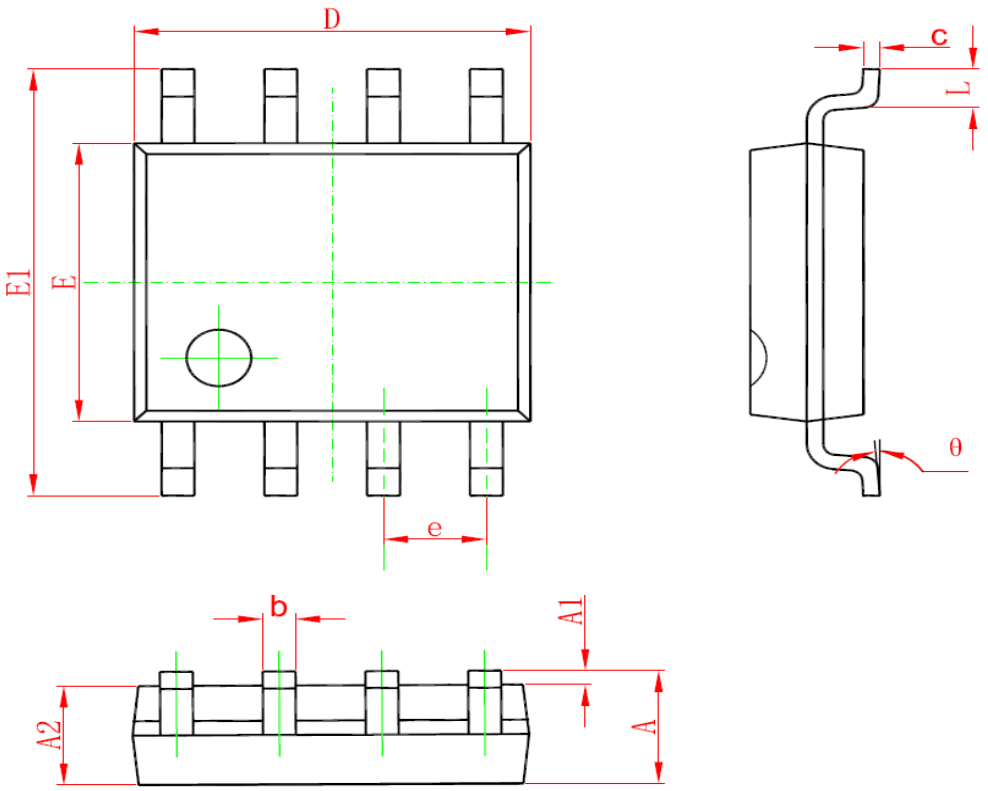
where V_{REF} = 1.23V, R1 between 1k and 5k

BLOCK DIAGRAM



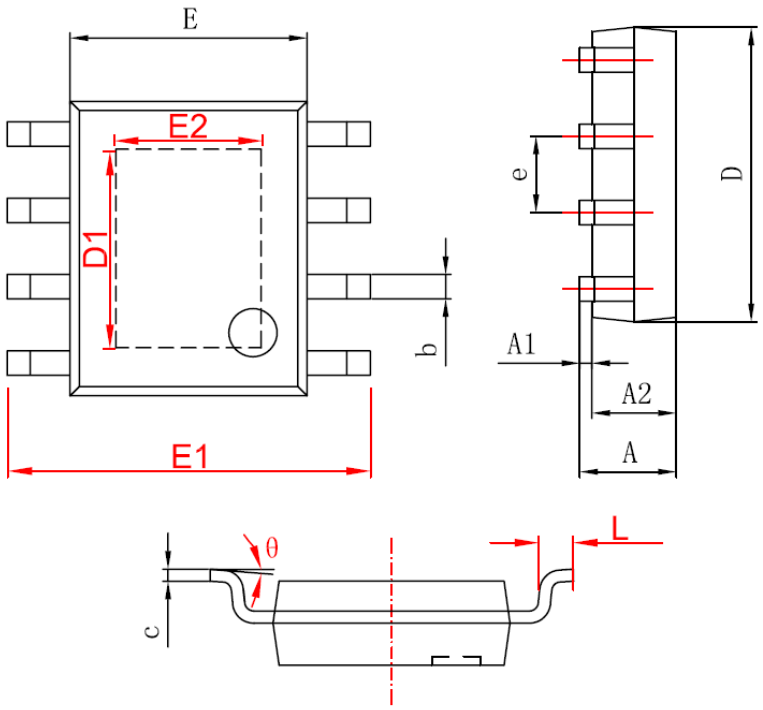
PACKAGE INFORMATION

Dimension in SOP8 (Unit: mm)



Symbol	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.700	5.100
E	3.800	4.000
E1	5.800	6.200
e	1.270(BSC)	
L	0.400	1.270
θ	0°	8°

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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