DESCRIPTION

The A7410 is a monolithic step-down DC/DC converter featuring a low EMI signature. It is capable of delivering up to 1 A output current without requiring an external power transistor, thereby reducing external component count and saving PCB area.

The device supports operation with up to a 95% duty cycle, enabling low dropout performance. An internal soft-start function limits inrush current during startup, helping to extend battery life in portable applications.

Comprehensive protection features are integrated, including cycle-by-cycle peak current limiting, short-circuit protection, thermal shutdown, and undervoltage lockout (UVLO).

The A7410 is available in a SOT-26 package.

FEATURES

- Wide Input Voltage Range: 4.5 V to 40 V
- Adjustable Output Voltage: 0.8 V to VIN
- Low $R_{DS(ON)}$ Internal Switches: 200 mΩ / 150 mΩ (High-side / Low-side)
- Typical Switching Frequency: 1.2 MHz
- High Duty Cycle Operation: up to 95%
- Short-Circuit Protection
- Overcurrent Protection
- Internal Soft-Start
- Thermal Shutdown Protection
- Available in SOT-26 Package

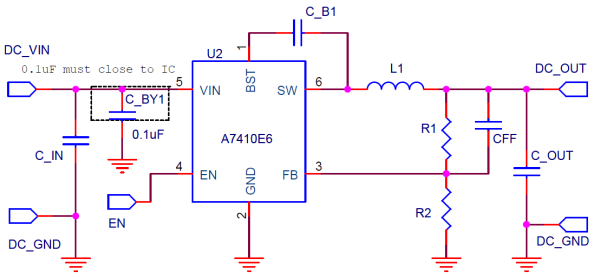
APPLICATION

- LCD Monitor and LCD TV
- Battery-powered Equipment
- Entertainment Devices
- Digital Home Appliances: Digital TVs
- ADSL Modem Portable Instruments

ORDERING INFORMATION

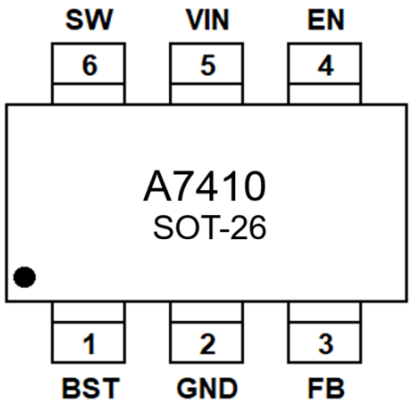
Package Type	Part Number	
SOT-26 SPQ: 3,000pcs/Reel	E6	A7410E6R
		A7410E6VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

SIMPLIFIELD SCHEMATIC



A7410, L1: PIA4030-4R7M

PIN DESCRIPTION



SOT-26, E6

Top View

PIN#	Symbol	Function
1	BST	Bootstrap. A capacitor connected between the SW and BS pins is required to provide a floating supply for the high-side switch driver.
2	GND	Ground pin.
3	FB	Feedback pin for the internal control loop. Connect this pin to an external resistor divider to set the output voltage.
4	EN	Device enable logic input. A logic high enables the device, while a logic low disables the device and places it into shutdown. Do not leave this pin floating.
5	VIN	Power supply voltage input.
6	SW	Switch node. Connects to the internal power FETs and the inductor. Connect the output filter inductor to this pin.

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted)

V_{IN}, and EN pin Voltage (1)	-0.3V ~ + 40V
BST, Voltage (1)	V_{SW}+5V
SW (less than 10ns) (2), Voltage (1)	-0.3V ~ V_{IN} + 0.5V
FB, Voltage (1)	-0.3V ~ +6V
T_J, Operating Junction Temperature	-40°C ~ +150°C
T_{STG}, Storage Temperature	-65°C ~ +150°C
$R_{\theta JA}$, Junction-to-Ambient Thermal Resistance	110°C/W
$R_{\theta JC(top)}$, Junction-to-Case (Top) Thermal Resistance	40°C/W

Stresses above 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 Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(1) All voltage values are with respect to network ground terminal.

(2) While switching.

RECOMMENDED OPERATING CONFITIONS

T_A=25°C, unless otherwise noted.*

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Operating Junction Temperature	-	-	-40	-	125	°C/W
Operating temperature range	-	-	-40	-	85	°C/W
Input Voltage	V_{IN}	-	4.5	-	38	V
Output Voltage	-	-	0	-	1	A

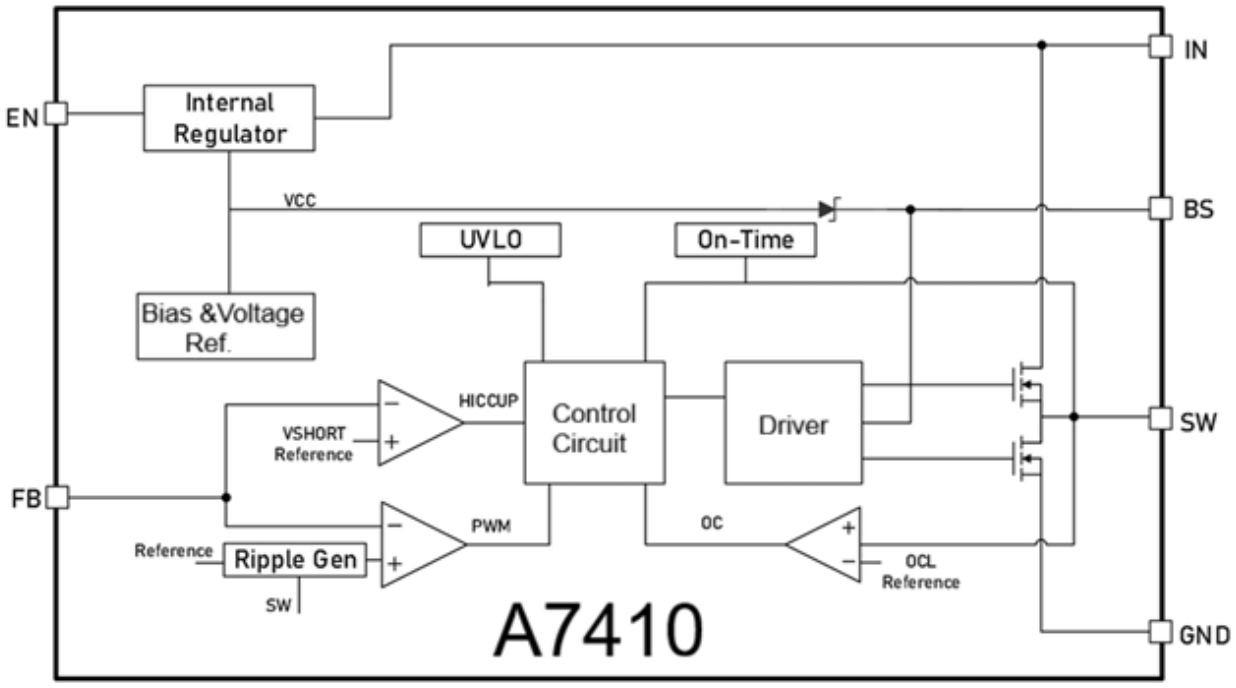
* All unused inputs of the device must be held at VCC or GND to ensure proper device operation.

ELECTRICAL CHARACTERISTICS

VIN =12V, unless otherwise specified. Typical values are at TA = 25°C.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	V_{IN}	-	4.5	-	38	V
Non-Switching Quiescent Current	I_Q	OUT=5V, I_{load}=0A	-	0.4	-	mA
Shut Down Current	I_{OFF}	EN=GND	-	-	4	μA
Regulated Feedback Voltage	V_{FB}	-	780	800	820	mV
V_{IN} Under Voltage Lockout	$V_{IN(UVLO)}$	-	3.7	3.8	4.0	V
V_{IN} Under Voltage Lockout Hysteresis		-	-	430	-	mV
ENABLE (EN PIN)						
Enable Threshold	$V_{(EN\_RISING)}$	Rising	1.5	-	-	V
	$V_{(EN\_FALLING)}$	Falling	-	-	0.4	V
Threshold Hysteresis	$V_{(EN\_HYS)}$	-	-	200	-	mV
POWER STAGE						
High-Side FET On Resistance	$R_{(HSD)}$	I_{SW}= 100mA	-	200	-	mΩ
Low-Side FET On Resistance	R(LSD)	I_{SW}= -100mA		150	-	mΩ
CURRENT LIMIT						
High Side FET Current Limit	I(LIM_HS)	FB=90%	-	1.5	-	A
OSCILLATOR						
Centre Switching Frequency	Fsw	OUT=5V, I_{load}=1A	1	1.2	1.5	MHz
POWER STAGE OUTPUT						
Rising Temperature	Thermal Shutdown	-	-	160	-	°C
Hysteresis		-	-	30	-	°C
Soft Start	-	-	0.8	1	1.2	ms

BLOCK DIAGRAM



DETAILED INFORMATION

Loop Operation

The A7410 is a monolithic switch-mode step-down DC/DC converter designed to deliver up to 1A of output current from a 4.5 V to 40 V input voltage range.

The device operates at a fixed 1.2 MHz switching frequency and employs a slope-compensated current-mode control architecture. An external logic-level shutdown control is provided, allowing the device to enter standby mode when disabled.

Internal loop compensation ensures good line and load regulation without requiring external compensation components.

Protection features include thermal shutdown to prevent damage from over-temperature operation and cycle-by-cycle current limiting to protect the internal power switch. When the current-limit condition is triggered and the feedback voltage (V_{FB}) falls below 0.8 V, the switching frequency is automatically reduced.

Application information

The A7410 is a high-performance monolithic step-down DC/DC converter featuring a wide input voltage range of 4.5 V to 40 V and capable of delivering up to 1.0 A of output current. The device operates at a fixed switching frequency of 1.2 MHz.

The A7410 requires only a few external power components, including an input capacitor (C_IN), an output capacitor (C_OUT), and an inductor (L1). The output voltage is programmable via an external feedback resistor divider, allowing adjustment from 0.8 V up to the input voltage.

$$V_{OUT} = 0.8 \times \frac{R1 + R2}{R2}$$

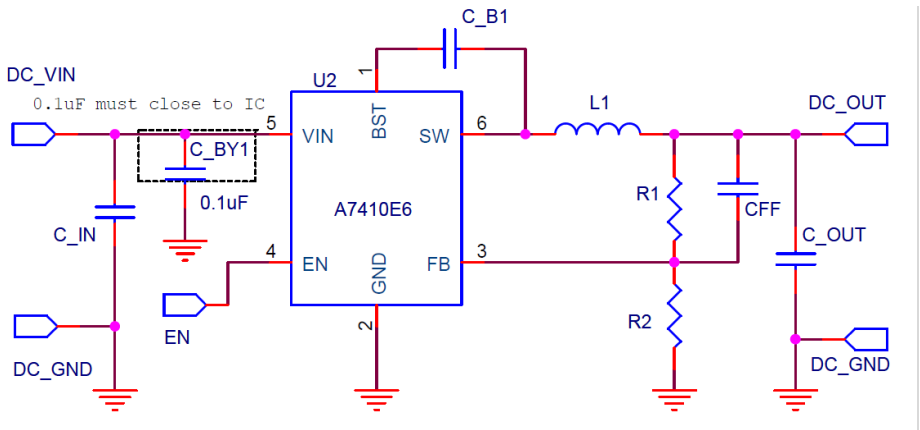


Table 1. Recommended Component Values

VOUT (V)	L1 (µH)	C1_B1 (µF)	C_BY1 (µF)	C_IN (µF)	C_OUT (µF)	CFF Opt. (pF)	R1 (kΩ)	R2 (kΩ)
3.3	4.7~15	0.1	0.1	22 ~47	22 ~ 47	10 ~ 100	47	15
5	4.7~15	0.1	0.1	2.2 ~47	22 ~ 47	10 ~ 100	43	8.2
L1= PIA4030-4R7, PIA4030-6R8 , PIA5030-100M, PIA5040-150M								

Power Supply Recommendations

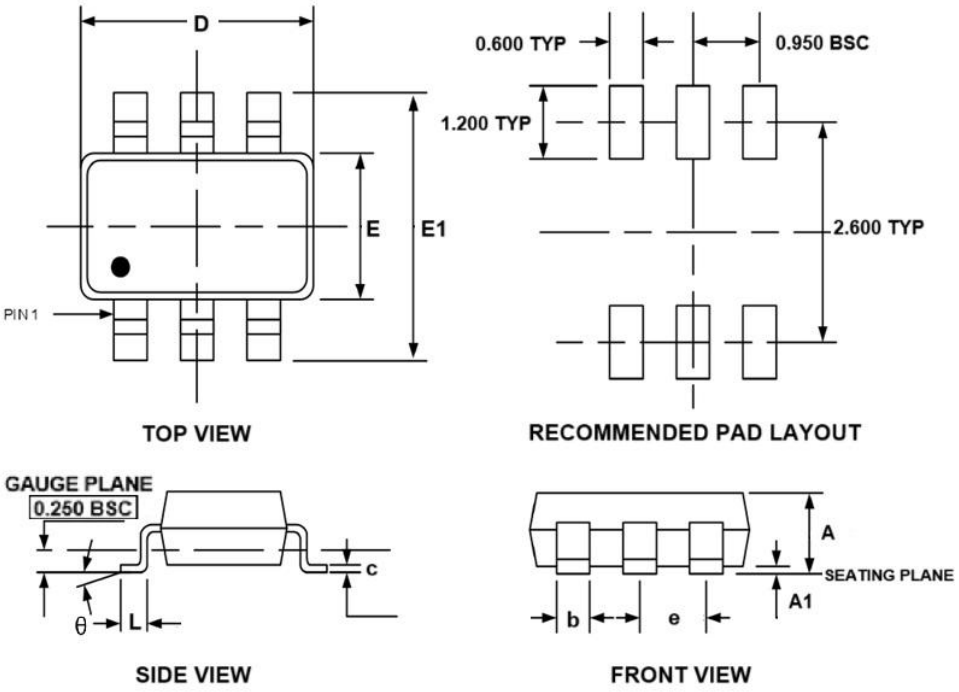
The device is designed to operate from an input supply voltage range of 4.5 V to 40 V. This input supply must be well regulated. If the input supply is located more than a few inches from the device or converter, additional bulk capacitance may be required in addition to the ceramic bypass capacitors. A 47 µF electrolytic capacitor is a typical choice.

Layout Guidelines

- The V_{IN} and GND traces should be as wide as possible to reduce trace impedance. Wide copper areas also improve heat dissipation.
- The GND trace between the output capacitor and the GND pin should be as wide as possible to minimize trace impedance.
- Place the input and output capacitors as close to the device as possible to minimize trace impedance.
- Use sufficient vias for the input and output capacitor connections.
- Keep the SW trace as short and as wide as practical to minimize radiated emissions.
- Do not allow high switching current paths to flow underneath the device.
- Route a separate V_{OUT} sense path to the upper feedback resistor.
- Make a Kelvin connection to the GND pin for the feedback network.
- Place the voltage feedback loop away from high-voltage switching nodes and, if possible, shield it with a ground trace or plane.
- Keep the V_{FB} node trace as short and as small as possible to reduce noise coupling.

PACKAGE INFORMATION

Dimension in SOT-26 (Unit: mm)



	Min	Max
A	-	1.450
A1	0.000	0.150
b	0.250	0.500
c	0.090	0.200
D	2.800	3.000
E	1.500	1.700
E1	2.600	3.100
e	0.950 BSC	
L	0.300	0.550
θ	0°	8°

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