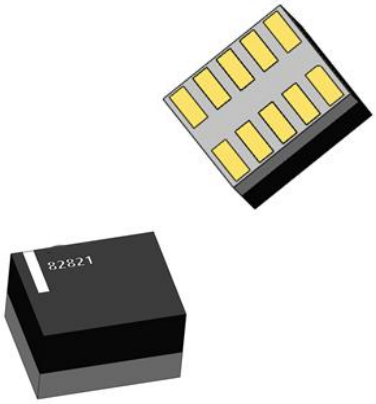
(2.5~5.5) V Input,1A Output, DC-DC Ceramic Substrate Adjustable Buck Module



1 Features

- Integrated power inductor on ferrite ceramic substrate, low EMI noise
- Ultra-small footprint (2.5mm × 2.0mm, thickness 1.40mm or 1.10mm)
- Integrated capacitors in a single-package plastic encapsulation, providing high reliability for surface mount applications
- Synchronous rectification technology achieves high efficiency, up to 95%.
- Automatic PFM/PWM Mode Switching Function
- Achieves 2% voltage accuracy over the full load current range
- Wide input voltage range:2.5V~5.5V
- Maximum Load Current:
  Vin=2.5V, Iout≤0.7A
  Vin=3.3V , Iout≤0.9A
  Vin=5.0V , Iout ≤1A
- Adjustable Output Voltage: 0.8V~4.0V
- Internal soft start, short-circuit protection, over current Protection, and overtemperature protection

2 Applications

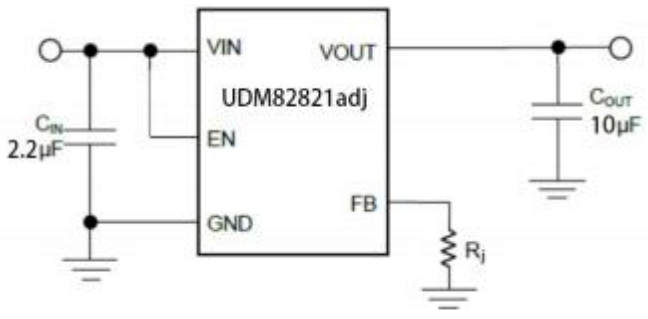
- Digital Camera
- Telecommunications and Network Applications, Optical Communications
- Alternative to linear regulators (LDO)
- Miniaturized applications

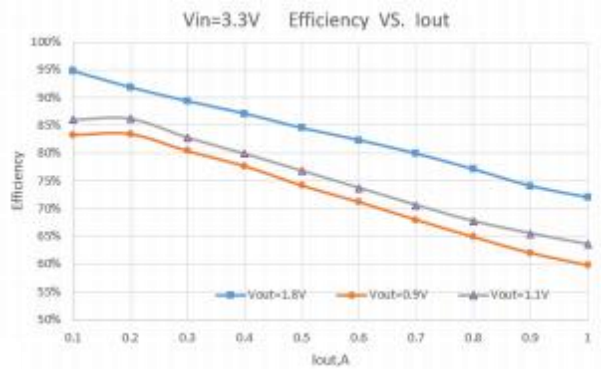
3 Description

The UDM82821adj is a low-power buck DC-DC converter module suitable for space-constrained and noise-sensitive applications. The module features an inductor-embedded ferrite substrate, which effectively reduces both radiated EMI noise and conducted noise. It uses a single-package plastic encapsulation to enhance mounting reliability.

By adding input/output capacitors, it can be used as an alternative to an LDO. Its low noise and ease of use ensure reliable power quality. The device smoothly switches between PFM and PWM modes based on the load current. Under light load conditions, it automatically switches to PFM mode to extend battery life. Under heavy load conditions, it automatically switches to PWM mode to ensure low ripple and high efficiency. The device maintains excellent output voltage accuracy even in PFM mode, keeping the output voltage accuracy within 2% over the entire load current range.

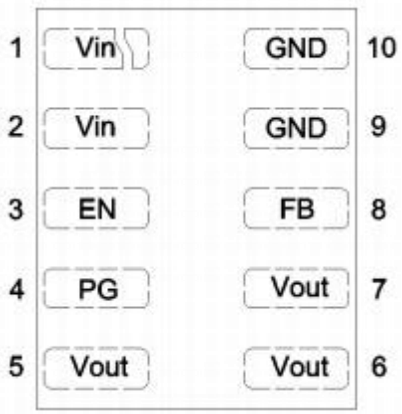
Typical Application Circuit





Note: Recommended Cin : 2.2uF/6.3V, Recommended Cout : 10uF/6.3V;Add more capacitance can decrease the ripple.

Pin Configuration



Top View

Pin	Symbol	Description
1，2	VIN	The Vin pin provides current to the internal regulator of the module.
3	EN	This is the on/off control pin of the device. Connecting this pin to GND keeps the device in the off mode. Pulling this pin to Vin enables the device with a soft start function. This pin must not be left floating. EN = H: Device On, EN = L: Device Off.
4	NC	No Electrical Connection
5,6,7	VOUT	Regulated output pin. Connect the output load between this pin and GND.
8	FB	Voltage Feedback Pin
9,10	GND	Ground Pin

Ordering Information

Product Model	Input Voltage	Output Voltage	Output current	Packaging	Product Grade
UDM82821adj IV#PBF	2.5~5.5V	0.8V~4.0V	Ioutmax=1A	3000pcs/roll	Industrial Grade

Product Model	Input Voltage	Output Voltage	Output current	Packaging	Product Grade
UDM82821adj MV#PBF	2.5~5.5V	0.8V~4.0V	Ioutmax=1A	3000pcs/roll	Military Grade

Electrical Characteristics

Absolute Maximum Ratings	Conditions	Minimum Value	Nominal Value	Maximum Value	Units
Input Voltage V_{IN}, EN		-0.3		6.5	V
Vsw		-0.3		Vin+0.3 or 6.3	V
Storage Temperature		-65		+150	℃
Electrical characteristics	**Conditions**	**Minimum Value**	**Nominal Value**	**Maximum Value**	**Units**
Input Voltage Range		2.5		5.5	V
Input Undervoltage Lockout Threshold	Rising V_{IN}		2.15	2.45	V
Input Undervoltage Lockout Hysteresis			170		mV
Quiescent current	EN=V_{IN} , No Load		26	40	μA
Shutdown current	EN = GND		0.47	1	μA
Switching Frequency			4.5		MHz
EN Threshold (On)		1.5			V
EN Threshold (Off)				0.3	V
Maximum Duty Cycle				100	%
Soft-Start Time			200		μs
Line regulation	2.5V < V_{IN}< 5.5V , I_{OUT} = 0.7A			±1.5	%
Load regulation	Vin=3.3V , 0A I_{OUT}≤ 0.6A			±2	%
Ripple and noise	V_{IN} =3.3V , V_{OUT} =1.1V , I_{OUT}=0.6A, C_{OUT}=10uF, Bandwidth:20MHz		20		mV
Dynamic load response	V_{IN}=3.3V , V_{OUT} =1.1V , 0.3A to 0.6A, di/dt=2A/μS , C_{OUT}=10uF, Bandwidth:20MHz		26		mV

Electrical Characteristics(continued)

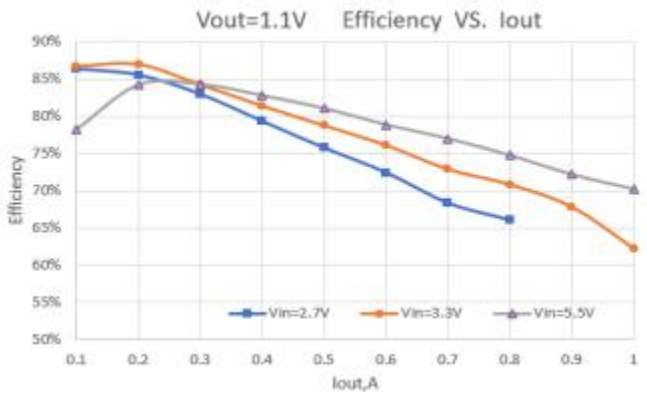
Structural Characteristics	Conditions	Minimum Value	Nominal Value	Maximum Value	Units
Dimensions	2.5mm×2.0mm×1.40mm or 2.5mm×2.0mm×1.10mm				mm
Weight			0.024		g
Environmental Adaptability	**Conditions**	**Minimum Value**	**Nominal Value**	**Maximum Value**	**Units**
Operating Temperature (Case Temperature)		-40		105	℃
High-Temperature Storage (Ambient Temperature)	+125℃， 48h				
High-Temperature Operation (Ambient Temperature)	+85℃， 24h; Low Input Voltage, Nominal Input Voltage, High Input Voltage, 8 hours each; V_{IN} =60V， V_{OUT} =12V， I_{OUT}=2.4A				
Low-Temperature Storage (Ambient Temperature)	-55℃， 24h				
Low-Temperature Operation (Ambient Temperature)	-40℃， 24h; Low Input Voltage, Nominal Input Voltage, High Input Voltage, 8 hours each;				
Humid Heat	High-Temperature and High-Humidity Stage: 60℃， 95%; Low-Temperature and High-Humidity Stage: 30℃， 95%; 10 cycles of 24h each				
Temperature Shock	High Temperature: 125℃, Low Temperature: -55℃, High and low temperatures of one hour each for a cycle, a total of 32 cycles of testing				

Note: Stress above the values listed in the "Absolute Maximum Ratings" section may cause permanent damage to the device. Exposure to any absolute maximum rating condition for extended periods may affect the reliability and lifespan of the device.

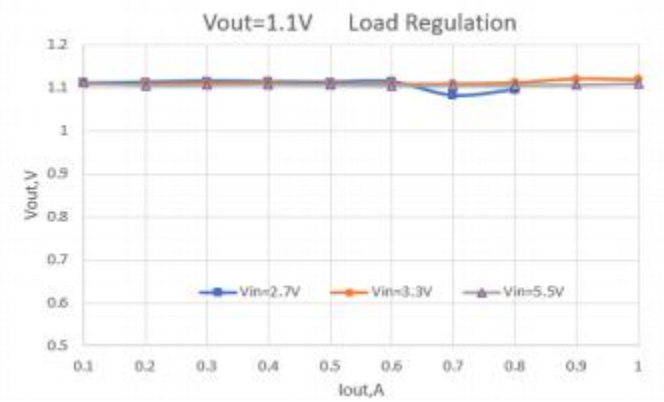
Typical characteristics

Unless otherwise noted, test conditions are T_ambient = 25℃

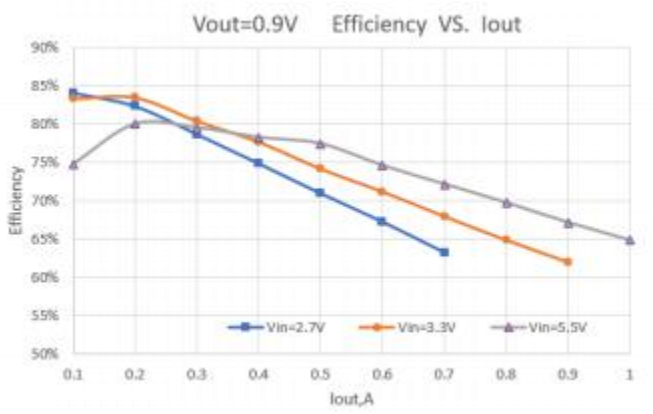
Efficiency



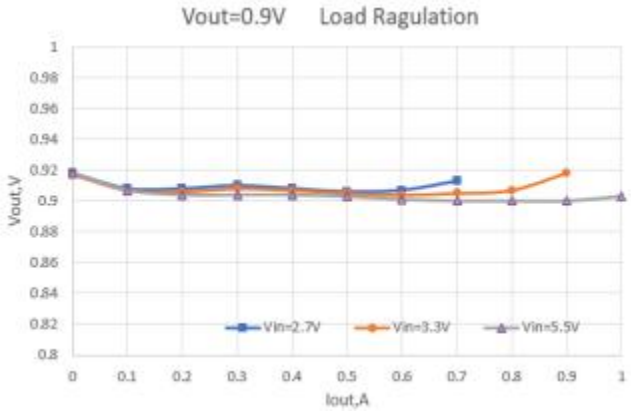
Load regulation



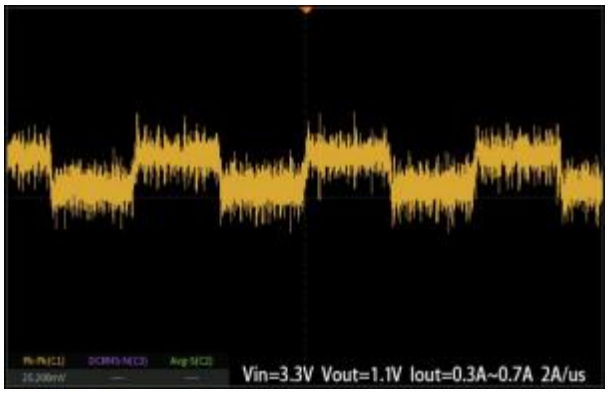
Efficiency



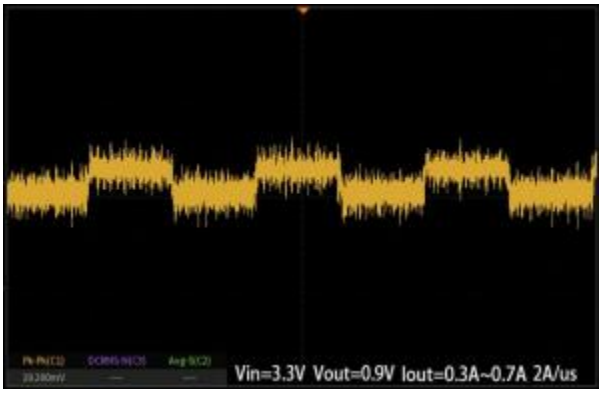
Load regulation



Dynamic Response



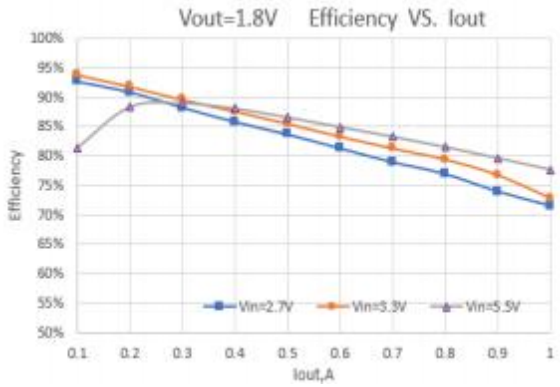
Dynamic Response



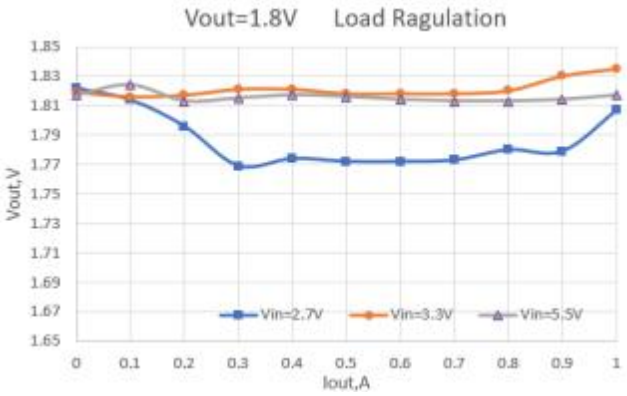
Typical characteristics

Unless otherwise noted, test conditions are T_ambient = 25℃

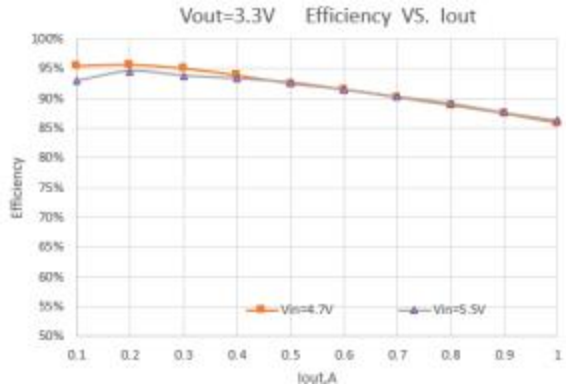
Efficiency



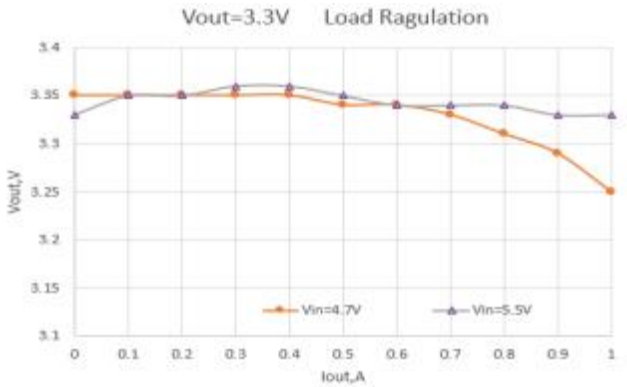
Load regulation



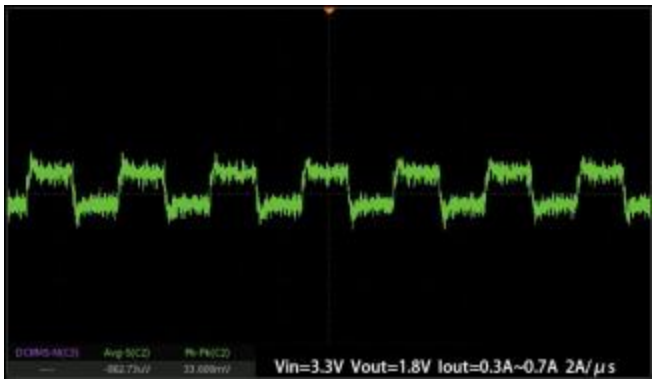
Efficiency



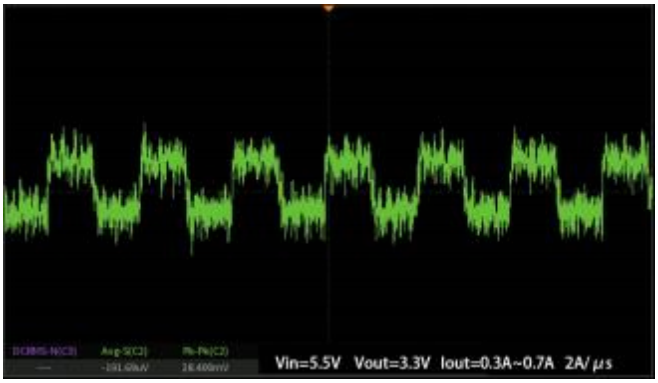
Load regulation



Dynamic Response



Dynamic Response



Operation

Summary

The UDM82821adj is a DC-DC buck power module with synchronous rectification control, featuring an embedded inductor on a magnetic ceramic substrate. It integrates a control IC, power MOSFETs, and filtering capacitors. The module requires only input and output capacitors for operation. It has a small footprint and high power density, making it particularly suitable for applications with limited board space.

It uses a ceramic substrate with a shielded structure, providing excellent EMI resistance. It combines high reliability, good thermal conductivity, and low temperature rise.

The device smoothly switches between PFM and PWM modes based on the load current. Under light load conditions, it automatically switches to PFM mode to extend battery life. Under heavy load conditions, it automatically switches to PWM mode to ensure low ripple and high efficiency. The device maintains good output voltage accuracy even in PFM mode.

It maintains 2% output voltage accuracy over the entire load current range (0 to 600mA).

Internal Soft-Start (SS)

The soft start function is designed to prevent inrush current during module startup. The UDM82821adj has an integrated soft start feature: when the module is enabled, the typical soft start time is 200μs.

Active Output Capacitor Discharge

After EN is turned off, an internal resistive discharge path (230Ω) is provided between the output capacitor and ground.

Overcurrent Protection and Short Circuit (OCP)

The UDM82821adj features cycle-by-cycle current limit protection. When the inductor current peak exceeds the internal peak current limit threshold, the upper transistor is turned off and a counter begins. After about ten consecutive occurrences, the device will enter the EN off state. Approximately 1.3ms later, EN will turn on again, and the power module will perform a soft start.

Overtemperature Shutdown Protection (OTP)

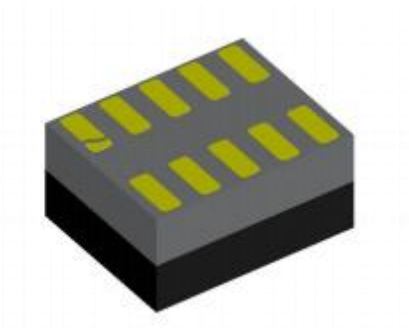
To prevent damage from overheating, the UDM82821adj stops switching when the internal chip temperature exceeds 160°C. Once the temperature falls below the threshold (typically 145°C), the module resumes operation.

Output Voltage Setting

The module internally integrates a pull-up resistor with a value of 120kΩ. The internal reference voltage is 0.8V. Customers can select the value of the pull-down resistor Rj based on their desired output voltage:

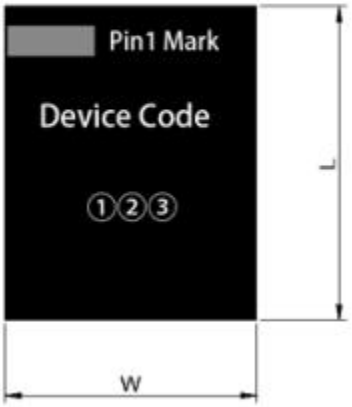
$$V_{out} = \left(1 + \frac{120k}{\quad}\right) \times 0.8V$$

PACKAGE DESCRIPTION

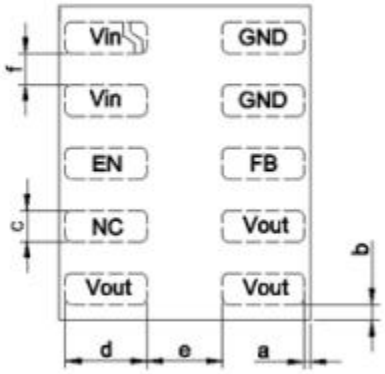


Side View

Top View



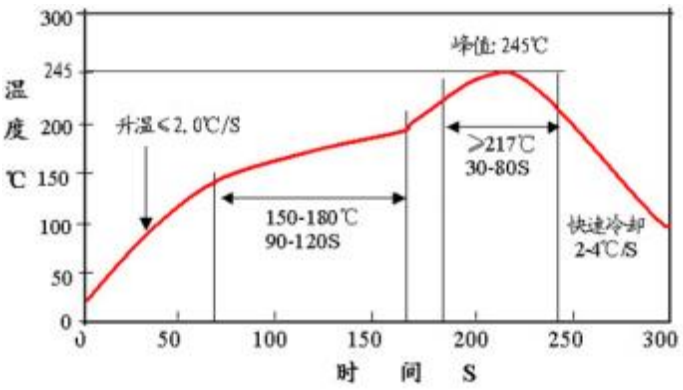
Top View
(Scenograph)



Symbol	Dimension (mm)
L	2.5±0.2
W	2.0±0.2
T	1.40Max or1.1Max
a	0.05
b	0.13
c	0.25
d	0.65
e	0.60
f	0.25

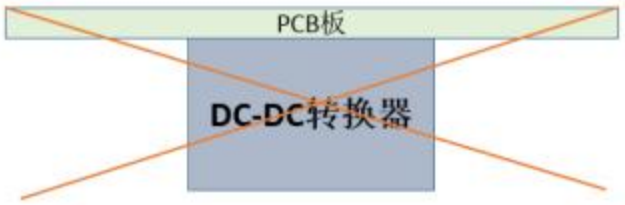
Soldering and Storage Precautions

Recommended Reflow Soldering Profile



Note:

1.Due to the larger size of the module, do not place the module on the bottom side of the board during reflow soldering to avoid module drop.



2. For bulk and unpackaged products, store them in a dry box (relative humidity should be kept below 10%). For products that are still in their original packaging, store them in a dry box whenever possible.

3.Before mounting, moisture-sensitive products must be baked according to strict baking conditions: bake for more than 48 hours at 125°C.