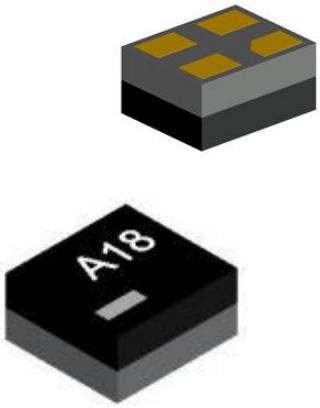
Magnetic Ceramic Substrate Power Module (MCS DC-DC Converter)



1 Features

- Integrated power inductor on a ferrite ceramic substrate, ultra-small area (5mm²), low EMI noise
- Integrated capacitor in a single-package mold, high reliability for surface mount
- Synchronous rectification technology achieves high efficiency
- Automatic PFM/PWM mode switching function
- Low ripple voltage PFM mode is used under light load conditions
- Achieves 2% voltage accuracy over the full load current range. Wide input voltage: 2.3V to 5.5V
- Maximum Load Current: 600mA(dependent on output voltage)
- Fixed Output Voltage: 0.8V~3.3V(Factory Set)
- Internal Soft Start and Overcurrent Protection

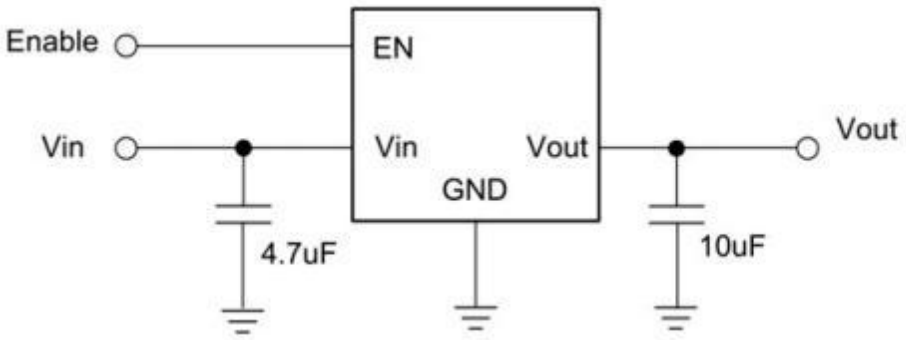
2 Description

The UDM2520I series is a low-power buck DC-DC converter suitable for space-constrained or noise-sensitive applications. The device features an embedded inductor on a ferrite substrate, which reduces radiated EMI noise and conducted noise. It also uses a plastic one-piece encapsulation to enhance mounting reliability.

By adding input/output capacitors, it can be used as an alternative to an LDO regulator. Its low noise and ease of use ensure reliable power quality.

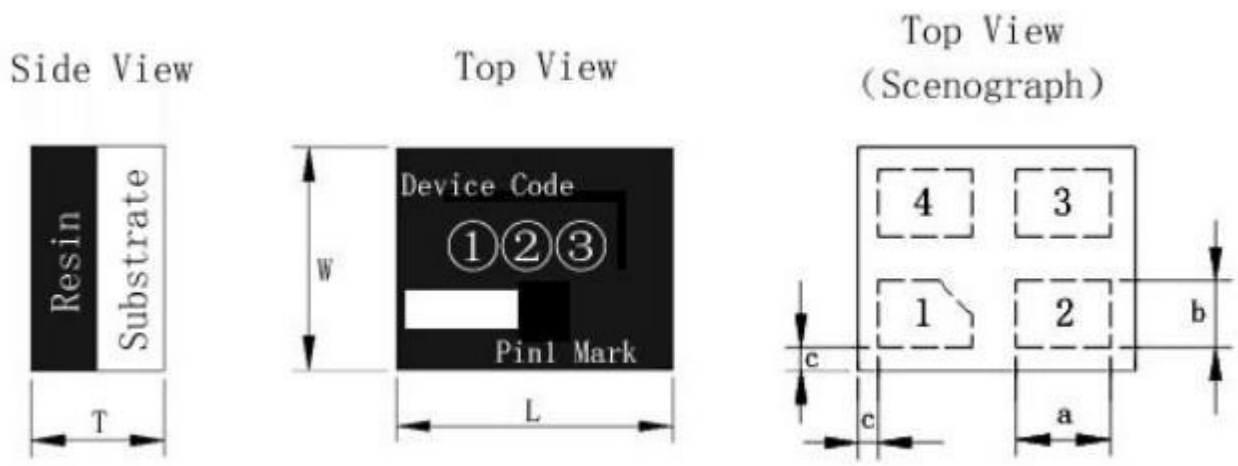
The device can smoothly switch between PFM mode and PWM mode based on the load current. Under light load conditions, it automatically switches to PFM mode to extend battery life; under heavier load conditions, it automatically switches to PWM mode to ensure low ripple and high efficiency. The device provides excellent output voltage accuracy even in PFM mode. It maintains 2% output voltage accuracy over the entire load current range (0 to 600mA).

3 Typical Application Circuit



4 PIN CONFIGURATION

4.1 Dimensions



Symbol	Dimension (mm)
L	2.5±0.2
W	2.0±0.2
T	1.35MAX
a	0.85±0.1
b	0.60±0.1
c	0.15±0.15

4.2 Pin Functions

Pin	Symbol	I/O	Description
1	Vin	Input	The Vin pin supplies current to the internal regulator of the UDM2520I.
2	EN	Input	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 soft start function of the device. The pin must not be left floating. If the pin is left open, the device may turn off at 100mA output. EN = H: Device ON, EN = L: Device OFF.
3	Vout	Output	Regulated output pin. Connect the output load between this pin and GND.
4	GND	-	Ground Pin (GND)

5 Ordering Information

Model	Output Voltage	Device Specific Features	MOQ
UDM2520I0V8K06A	0.8V	Standard Types	T/R,3000pcs/R
UDM2520I1V0K06A	1.0V	Standard Types	T/R,3000pcs/R
UDM2520I1V2K06A	1.2V	Standard Types	T/R,3000pcs/R
UDM2520I1V6K06A	1.6V	Standard Types	T/R,3000pcs/R
UDM2520I1V8K06A	1.8V	Standard Types	T/R,3000pcs/R
UDM2520I2V5K05A	2.5V	Standard Types	T/R,3000pcs/R
UDM2520I3V3K03A	3.3V	Standard Types	T/R,3000pcs/R

The output voltage can be set from 1.0V to 3.3V. For detailed information, please contact us.

6 Electrical Characteristics

6.1 Absolute Maximum Ratings

Parameter	Symbol	Range	Unit
Input Voltage	$V_{in,EN}$	6.3	V
Operating Ambient Temperature	T_a	-40 to +85	℃
Operating Case Temperature	T_{IC}	-40 to +125	℃
Storage Temperature	T_{STO}	-40 to +85	℃

6.2 Electrical Characteristics（T_a = 25℃)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Input Voltage	Vin			2.3	3.6	5.5	V
UVLO Voltage	UVLO			1.0	1.4	1.8	V
Input Leakage Current	Iin-off	Vin=3.6V, EN=0V	UDM2520I0V8K06A UDM2520I1V0K06A UDM2520I1V2K06A		0	2	μA

			UDM2520I1V6K06A				
			UDM2520I1V8K06A				
			UDM2520I2V5K05A				
		Vin=5V, EN=0V	UDM2520I3V3K03A				
Output Voltage Accuracy	Vout				1	2	%
Output Voltage Range	Vout	Vin-Vout>1V	UDM2520I0V8K06A	0.784	0.800	0.816	V
			UDM2520I1V0K06A	0.980	1.000	1.020	
			UDM2520I1V2K06A	1.176	1.200	1.224	
			UDM2520I1V6K06A	1.568	1.600	1.632	
			UDM2520I1V8K06A	1.764	1.800	1.836	
			UDM2520I2V5K05A	2.450	2.500	2.550	
		Vin-Vout>0.5V	UDM2520I3V3K03A	3.234	3.300	3.366	
Load Current Range Overview	Iout	UDM2520I0V8K06A		0		600	mA
		UDM2520I1V0K06A					
		UDM2520I1V2K06A					
		UDM2520I1V6K06A					
		UDM2520I1V8K06A					
		UDM2520I2V5K05A		0		500	
		UDM2520I3V3K03A		0		300	
Ripple Voltage	Vrpl	Vin=3.6V, Iout=300mA, BW=20MHz	UDM2520I0V8K06A		15		mV
			UDM2520I1V0K06A				
			UDM2520I1V2K06A				
			UDM2520I1V6K06A				
			UDM2520I1V8K06A				
			UDM2520I2V5K05A				
		Vin=5V, Iout=300mA, BW=20MHz	UDM2520I3V3K03A				
Efficiency	EFF	Vin=3.6V, Iout=150mA	UDM2520I0V8K06A		76		%
			UDM2520I1V0K06A		78		
			UDM2520I1V2K06A		80		
			UDM2520I1V6K06A		83		
			UDM2520I1V8K06A		85		
			UDM2520I2V5K05A		88		
		Vin=5V, Iout=150mA	UDM2520I3V3K03A		88		
EN Control Voltage	VENH	ON: Enable		1.4		Vin	V

	V_{ENL}	OFF:Disable	0		0.25	V
Switching Frequency (SW Frequency)	F_{osc}		2.5	3.0	3.5	MHz
Overcurrent Protection	OCP	UDM2520I0V8K06A	600	900	1200	mA
		UDM2520I1V0K06A				
		UDM2520I1V2K06A				
		UDM2520I1V6K06A				
		UDM2520I1V8K06A				
		UDM2520I2V5K05A	500	900	1200	
		UDM2520I3V3K03A	300	700	1200	
Soft Start Time	T_{on}			1		ms

1.The external capacitor (Cin : 4.7μF, Cout : 10μF) should be placed near the device to ensure proper operation.
2.The above characteristics were tested using the test circuit described in Section 8.

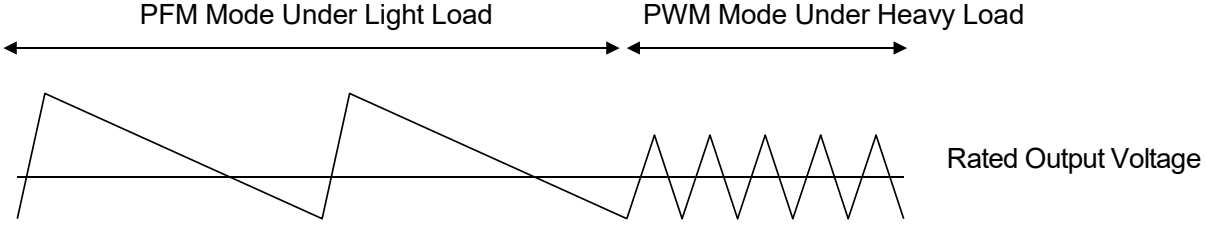
7 Detailed description

PFM / PWM Modes

If the load current drops to the light load range, the point-of-load (POL) power supply will automatically enter PFM mode. In PFM mode, the device operates in discontinuous current mode with sporadic switching pulses to maintain high efficiency at light loads.

The device uses constant on-time control in PFM operation, which produces low ripple voltage and precise output voltage compared to other PFM architectures. Due to this architecture, the DC output voltage can be maintained within ±2% of the nominal voltage. By increasing the output capacitance, the output voltage ripple in PFM mode can be further reduced.

The transition between PFM and PWM modes is smooth, and the switching current value between the two modes depends on factors such as Vin and Vout. However, the threshold range is typically (100~200) mA.



UVLO (Undervoltage Lockout)

Even if the EN pin is held high, the input voltage (Vin) must reach or exceed the UVLO voltage (1.4V typical) before the device starts up. The UVLO feature prevents undefined operation at low Vin levels.

Soft Start

The device features an internal soft-start function that limits inrush current during startup. The soft-start system gradually increases the switching time from the minimum pulse width to normal operation. Due to this feature, the output voltage gradually rises from zero to the rated voltage during startup. The nominal soft-start time is 1ms.

EN

When the EN pin is set to a high logic level, the device begins operation and starts up with a soft-start sequence. For normal operation, the EN pin must be connected to a logic high level and must not be left floating. If the pin is left open, the device may operate under light load conditions but will fail to function properly under heavy load conditions.

Pulling the EN pin to a logic low level will force the device to shut down.

100% Duty Cycle Operation

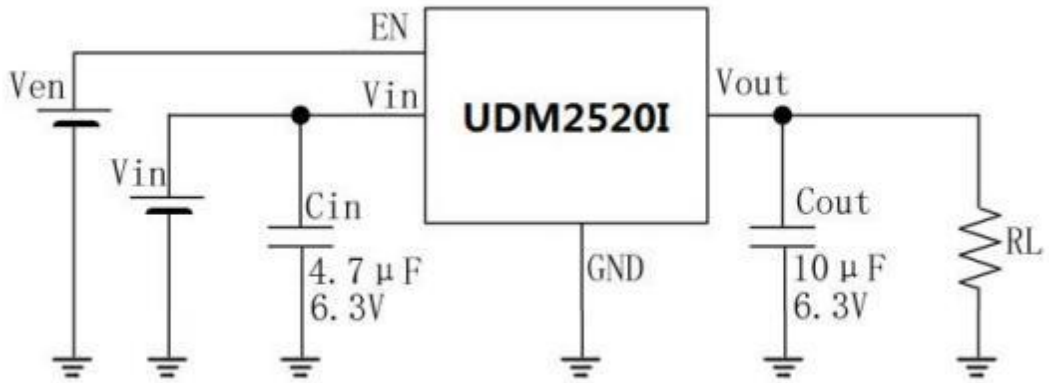
The device can operate in 100% duty cycle mode, where the high-side switch is always on, providing a lower input-to-output voltage difference.

When Vin and Vout become close and the duty cycle approaches 100%, the switching pulses may skip the nominal switching cycle, resulting in higher output voltage ripple compared to other conditions. However, this does not indicate a fault in the device.

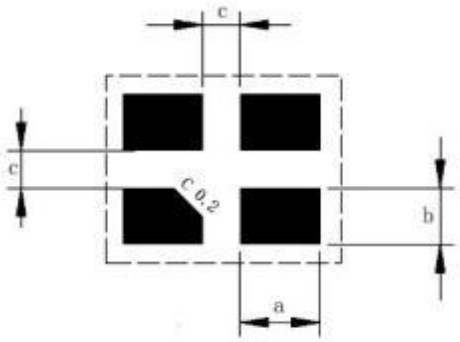
Overcurrent Protection (OCP)

When the output current reaches the OCP threshold, the device will reduce the switching duty cycle, lowering the output voltage. If the OCP event is cleared within the blanking time (20μs typical), the output voltage will automatically recover to the nominal value. If the OCP event persists beyond the blanking time, the device will shut down. After shutdown, the device can be restarted by toggling the Vin or EN voltage.

8 Test Circuit



9 PCB Pad Recommendations



Symbol	Dimension（mm）
a	0.85
b	0.60
c	0.5

10 Mark information

①：产品系列

UDM2520I
A

②：输出电压首位

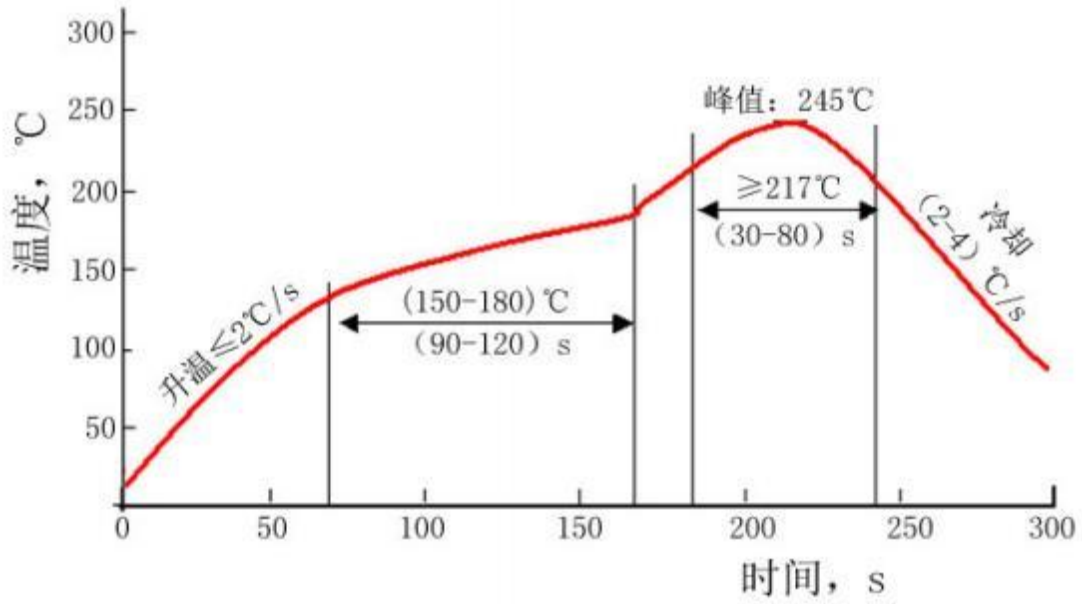
0.XX	1.XX	2.XX	3.XX	4.XX	5.XX
0	1	2	3	4	5

③：输出电压末位

输出电压	标识	输出电压	标识
X.00	0	X.05	a
X.10	1	X.15	b
X.20	2	X.25	c
X.30	3	X.35	d
X.40	4	X.45	e
X.50	5	X.55	f
X.60	6	X.65	g
X.70	7	X.75	h
X.80	8	X.85	i
X.90	9	X.95	j

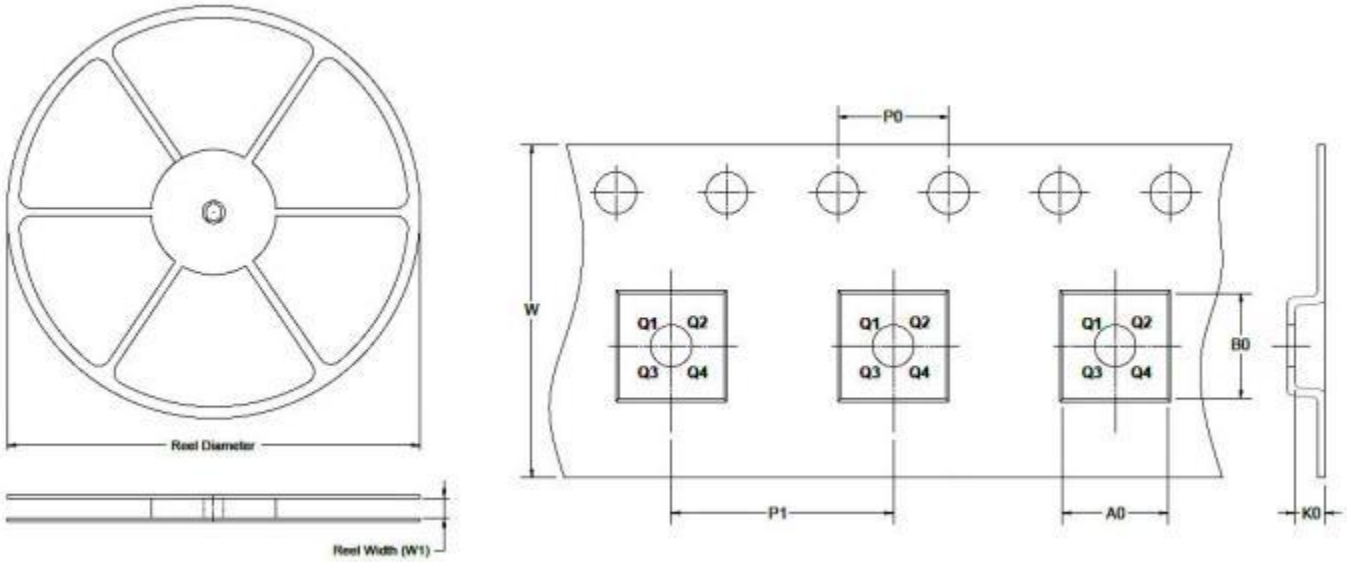
11 Recommended Soldering Process

Recommended Reflow Soldering Profile



Note: For bulk and opened original packaging products, store them in a dry cabinet (the relative humidity in the dry cabinet should be kept below 10%). For unopened original packaging products, store them in a dry cabinet whenever possible.

12 Packaging Information



Reel and Tape Main Dimensions

Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant	MOQ
7″	8.8	2.35	2.80	1.35	4.0	4.0	8.0	Q1	T/R,3000pcs/R