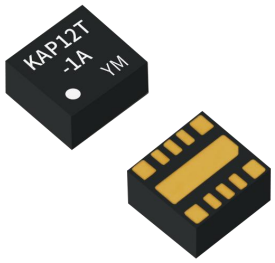
Regulated single output
DC-DC converter ultra-thin DFN package



Patent Protection RoHS

FEATURES

- Ultra-small, ultra-thin DFN package(3x2.8x1.6 mm)
- Operating ambient temperature range: -40℃ to +105 ℃
- High efficiency up to 92%
- Output short-circuit protection
- Over-temperature protection
- Input under-voltage protection

KAP12T-1A is high efficiency switching regulators. The converters feature high efficiency, low loss and short-circuit protection in a compact DFN package. These products are widely used in applications such as industrial control, electric power, instrumentation and consumer electronics

Selection Guide

Certification	Part No.	Input Voltage (VDC)*	Output		Full Load Efficiency (%) Typ. Vin=5.0V, Vo=4.0V	Capacitive Load (μF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max.		
--	KAP12T-1A	12 (4.5~17)	0.6~5.5	1000	92%	330

Note: ①When the input voltage spike exceeds 17VDC, an electrolytic capacitor should be added before the product input end according to the actual working conditions to filter out the voltage spike to prevent the module from being damaged by the voltage spike;
②The low-pressure output must ensure the input-output pressure difference to meet the set output requirements. For example, when 2.5V≤Vo≤3.3V, the input-output voltage difference needs to be ≥2.2V; When 3.3V < Vo≤5.5V, the input-output pressure difference needs to be ≥3V.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (no-load)	Vin=12V, Vo=1.2V, Io=0A	--	8	--	mA
Start-up Voltage	0-100%Io	--	--	4.2	VDC
Under-voltage Protection	0-100%Io	3	--	--	
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			
ENI*	Module on	Ctrl pin pulled high TTL (1.5VDC~VIN)			
	Module off	Ctrl pin pulled low to GND (0~0.5VDC)			
	Input current when off	--	50	--	uA

Note: *The voltage of the control pin (EN) is relative to pin GND. The control pin (EN) cannot be left floating. When the EN pin is not in use, a high level (1.5VDC to VIN) can be directly connected.

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Voltage Accuracy	Full load, input voltage range	--	±1	--	%
Linear Regulation	Full load, input voltage range	--	±1	--	
Load Regulation	Nominal input voltage, 0% -100% load	--	±1	--	
Ripple & Noise*	20MHz bandwidth, nominal input voltage, full load	--	20	--	mVp-p
Temperature Coefficient	Operating temperature -40℃ to +105℃	--	±0.02	--	%/℃
Transient Response Deviation	Nominal input voltage, 25% load step change	--	±100	--	mV
Transient Recovery Time		--	100	--	us

Short-circuit Protection		Continuous, self-recovery
Note: * The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information;		

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Operating Temperature	See Fig. 1	-40	--	105	℃
Storage Temperature		-55	--	125	
Storage Humidity	Non-condensing	5	--	95	%RH
Reflow Soldering Temperature		Peak temperature ≤245℃, duration ≤60s max. over 217℃			
Switching Frequency	Full load, nominal input voltage	--	1.4	--	MHz
MTBF	MIL-HDBK-217F@25℃	10000	--	--	k hours
Operating altitude		--	--	2000	m
Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Moisture Sensitivity Level (MSL)**	IPC/JEDEC J-STD-020D.1	Level 3			
Pollution Degree		PD 3			

Note: *Please refer to IPC/JEDEC J-STD-020D.1.
**For moisture sensitivity control, please refer to the information on the packaging.

Mechanical Specifications

Dimensions	3 x 2.8 x 1.6 mm
Weight	0.046g（typ.）
Cooling Method	Free air convection

Typical Characteristic Curves

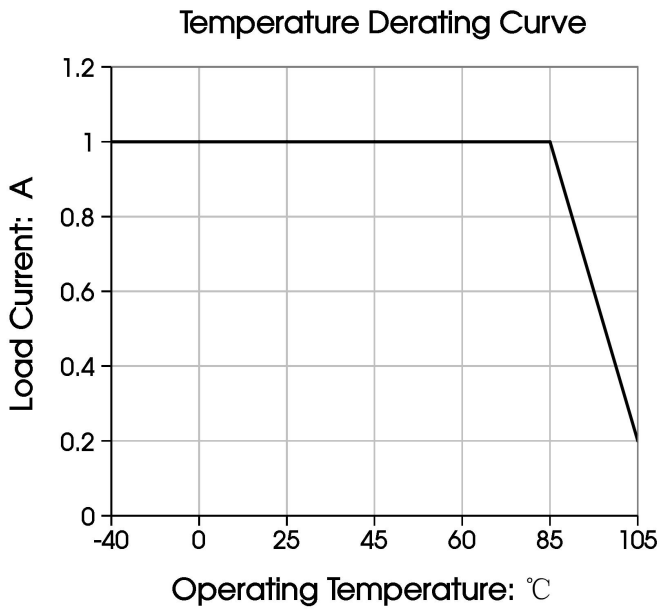
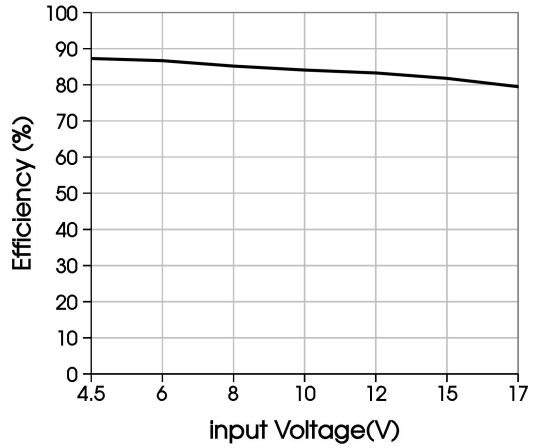
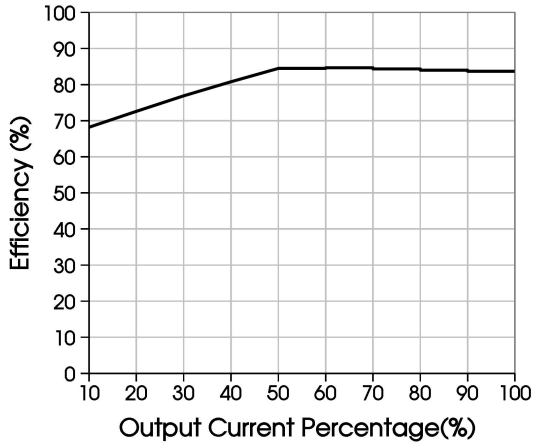


Fig. 1

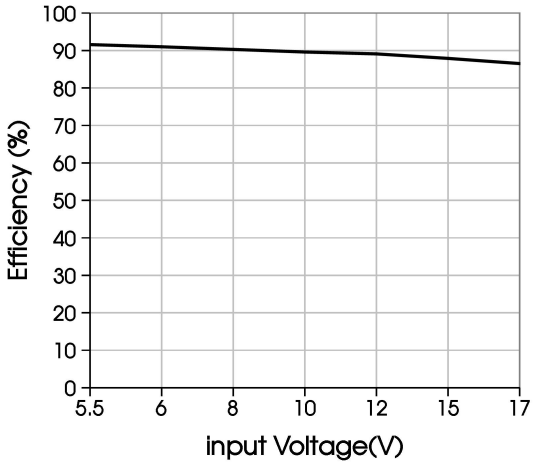
1.8Vo Efficiency Vs input Voltage(Full Load)



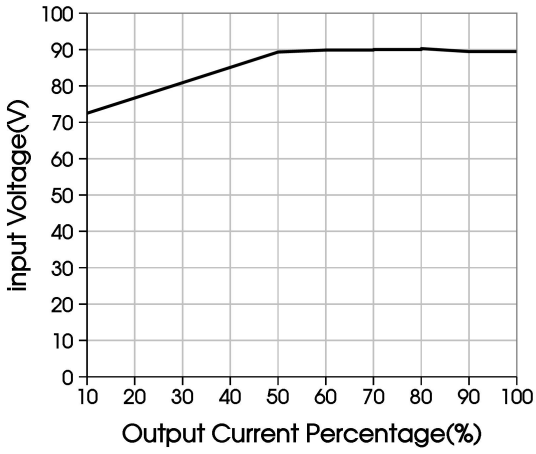
1.8Vo Efficiency Vs Output Load(Vin=12V)



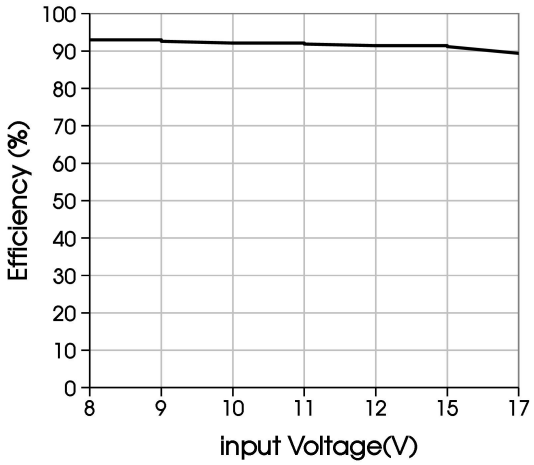
3.3Vo Efficiency Vs input Voltage(Full Load)



3.3Vo Efficiency Vs Output Load(Vin=12V)



5.0Vo Efficiency Vs input Voltage(Full Load)



5.0Vo Efficiency Vs Output Load(Vin=12V)

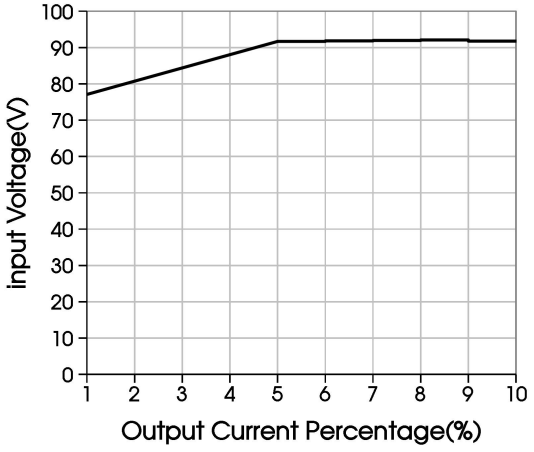


Fig. 1

Design Reference

1. Typical application

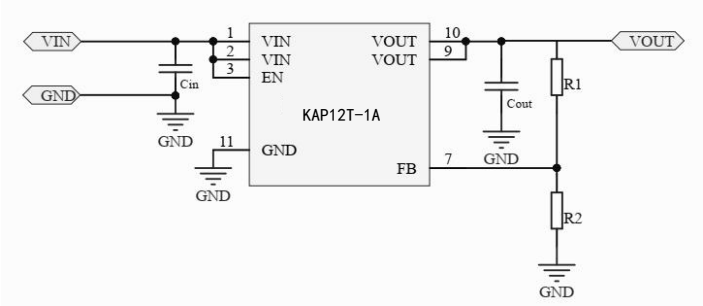


Fig. 3 Typical application circuit

Output voltage	Cin (ceramic capacitor	Cout (ceramic capacitor	R1	R2
0.6V	10uF/25V	226k/16V	3kΩ	/
1.8V			3kΩ	1.5kΩ
3.3V			6.8kΩ	1.5kΩ
5.0V			11kΩ	1.5kΩ

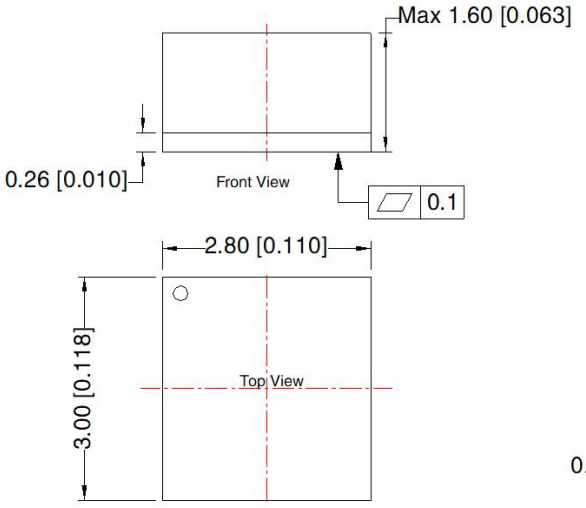
Table 1

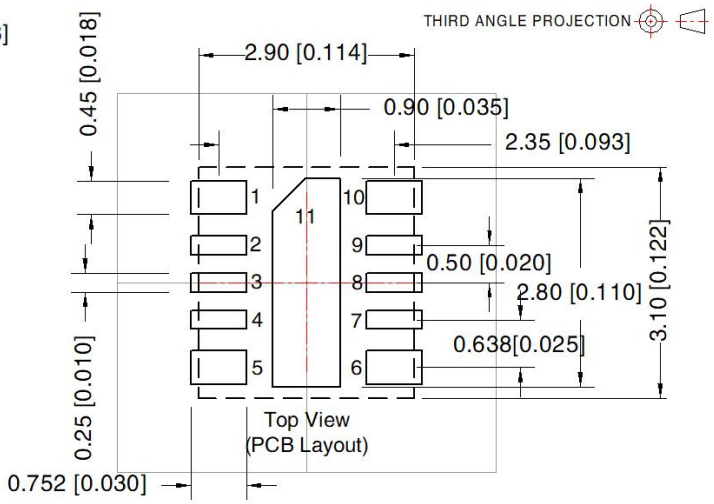
$$\text{Output voltage}: Vout = 0.6 \times (1 + \frac{R_1}{R_2})$$

Notes:
1. The required Cin and Cout capacitors must be connected as close as possible to the terminals of the module;
2. Refer to Table 1 for Cin and Cout capacitor values. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead;
3. Converter cannot be used for hot swap and with output in parallel.

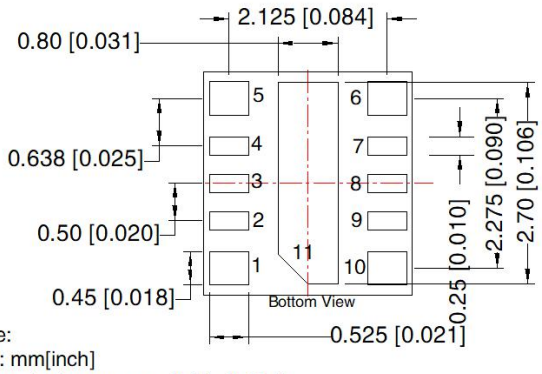
2. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout





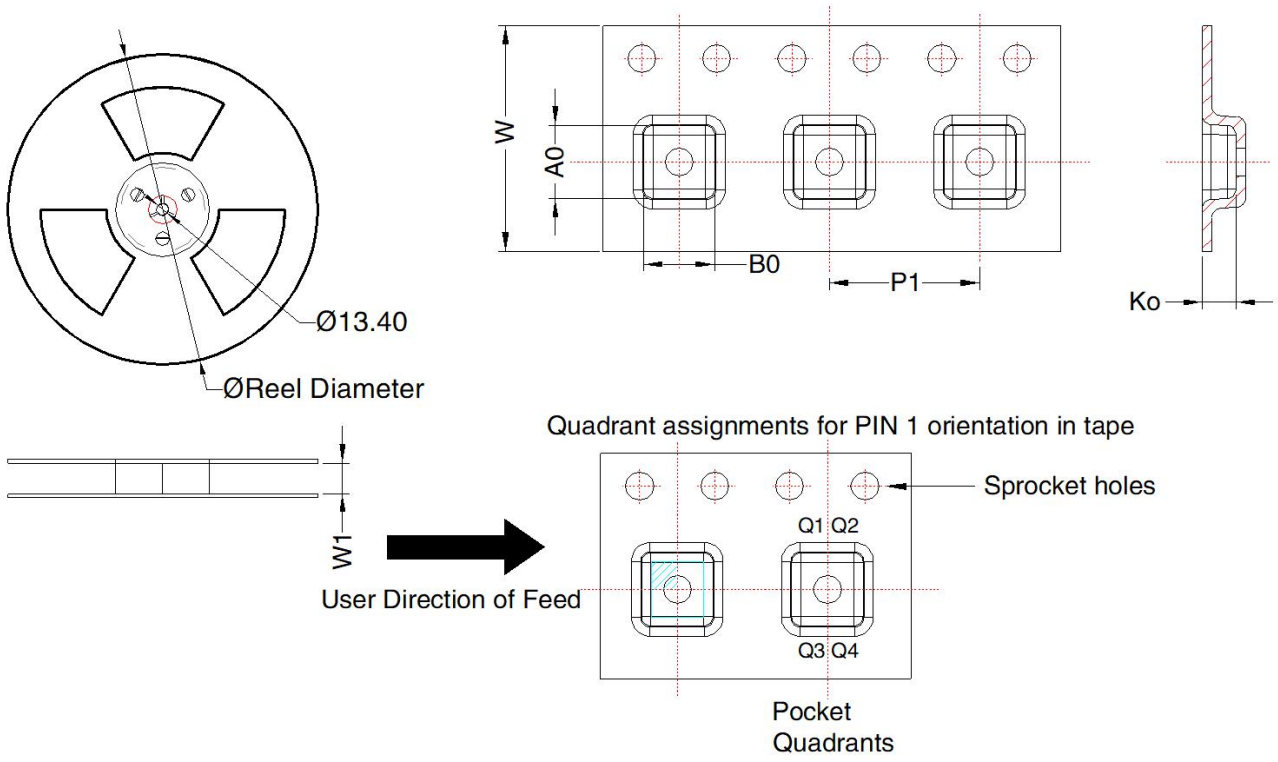
Note: Grid 2.54*2.54mm



Note:
Unit: mm[inch]
General tolerances: ±0.1[±0.004]

Pin–Out	
Pin	Mark
1,2	Vin
3	EN
4	NC
5	NC
6	NC
7	FB/VSET
8	NC
9,10	Vout

Tape/Reel packaging



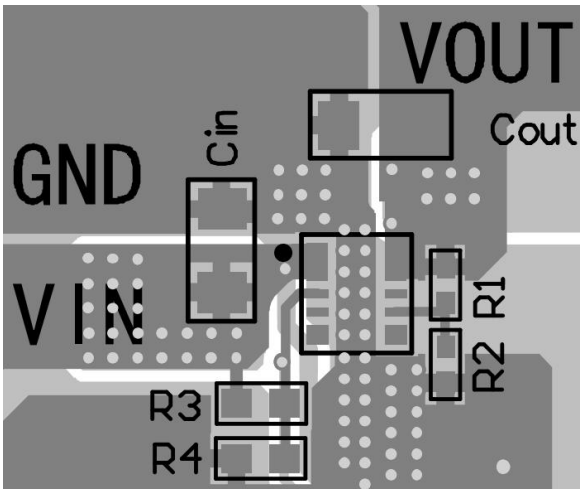
Device	Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
KAP12T-xA	QFN	10	1050	178.0	12.4	3.8	3.9	1.8	8.0	12.0	Q1

PCB Recommended layout

KAP12T-1A series switching frequency up to 1.4MHz, PCB layout has a greater impact on product performance, when designing the PCB, please refer to the following points.

- Keep the component layout as compact as possible.
- Keep the input capacitors Cin as close as possible to VIN and GND, and Cin is within 3mm of the product VIN and GND.
- Keep the output capacitors Cout as close as possible to VOUT and GND, and Cout is within 3mm of the product VOUT and GND.
- Use wide and short alignments for main power alignment.

Refer to the diagram on the right for specific layout



Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Tape/Reel packaging bag number: 58240119;
2. The maximum capacitive load offered were tested at nominal input voltage and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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