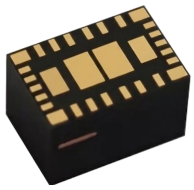
Regulated single output
DC-DC converter ultra-thin DFN package



RoHS

FEATURES

- Ultra-small, ultra-thin DFN package(6x4x3.7 mm)
- Operating ambient temperature range：-40℃ to +105 ℃
- High efficiency up to 95 %
- No-load input current as low as 50 uA
- Output short-circuit protection

KAP24xxT-3A 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, instrumentation and electric power.

Selection Guide

Certification	Part No.	Input Voltage (VDC)①	Output		Full Load Efficiency (%) Typ.	Capacitive Load (μF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max.②		
--	KAP24T-3A	24 (4.5~36)③	1.0-16	3000	95% (Vin=24.0V, Vo=16V)	470
--	KAP2405T-3A	24 (6.5~36)	5	3000	90%	470
--	KAP2403T-3A	24 (5~36)	3.3	3000	85%	470

Note: ①When the input voltage peak exceeds 36VDC, the input end needs to be connected with an external 47uF/50V electrolytic capacitor to prevent the module damage caused by the voltage peak;

②When the output voltage Vo > 3.3V, the maximum output current is 2000mA； ;

③When KAP24T-3A is 1.0≤Vo < 9V, Ensure that the input-output pressure difference is greater than or equal to 2V. When Vo≥9V, Ensure that the input-output pressure difference is greater than or equal to 3V.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (no-load)	KAP2403T-3A,KAP2405T-3A,KAP24T-3A(Vo=2.5V)	--	50	--	uA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			
Start-up Voltage		--	--	4.2	V
Under-voltage shutdown		2.5	--	--	
ENI*	Module on	Ctrl pin pulled high(TTL (2~VIN)			
	Module off	Ctrl pin pulled low to GND (0~0.3VDC)			
EN turns off the current	EN=0V	--	30	--	uA

Note: The voltage of the positive output remote control pin (EN) control pin is relative to pin GND.

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Voltage Accuracy	Full load, input voltage range	--	±0.5	±3	%
Linear Regulation	Full load, input voltage range	--	±0.5	±2	%
Load Regulation	Nominal input voltage, 20% -100% load	--	±1	±2	
Ripple & Noise*	20MHz bandwidth, KAP2403T-3A,KAP2405T-3A, full load	--	40	100	mVp-p
	20MHz bandwidth, KAP24T-3A(Vo=12V), full load	--	100	200	
Temperature Coefficient	Operating temperature -40℃ to + 105℃	--	±0.02	--	%/℃
Transient Response Deviation	Nominal input voltage, 25% load step change	--	±50	--	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℃			
MTBF	MIL-HDBK-217F@25℃	10000	--	--	k hours
Operating altitude		--	--	2000	m
Switching Frequency	KAP2403T-3A,KAP2405T-3A, full load	--	900	--	kHz
	KAP24T-3A(Vo=12V), full load	--	1100	--	
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.

Mechanical Specifications

Dimensions	6 x 4 x 3.7 mm
Weight	0.28 g
Dimensions	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A
	RE	CISPR32/EN55032 CLASS A

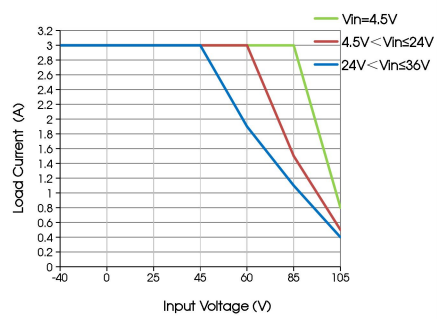
Note: See Fig. 4 for recommended circuit

ESD 特性

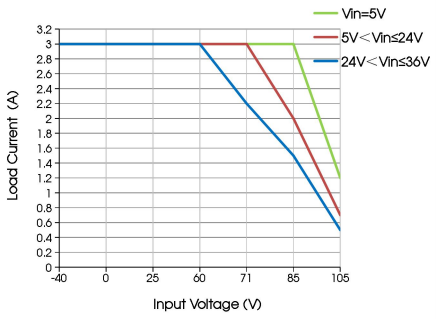
Item	Operating Conditions	Min.	Typ.	Max.	Unit
HBM		±1500	--	--	V
CDM		±500	--	--	

Typical Characteristic Curves

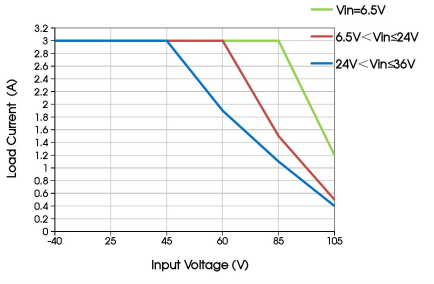
Vo=2.5V Temperature derating curve



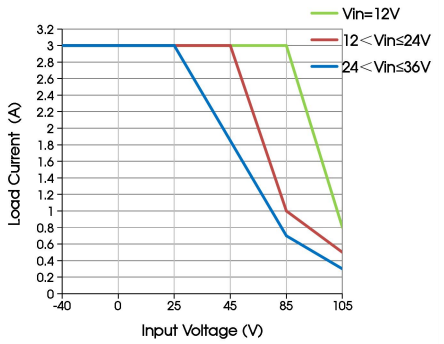
Vo=3.3V Temperature derating curve



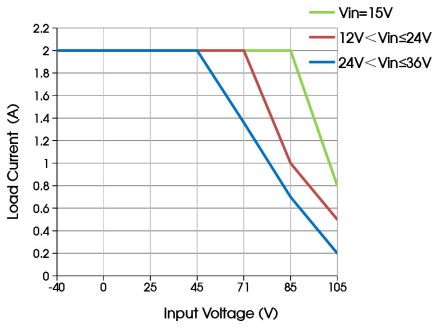
Vo=5V Temperature derating curve



Vo=9.0V Temperature derating curve



Vo=12V Temperature derating curve



Vo=15V Temperature derating curve

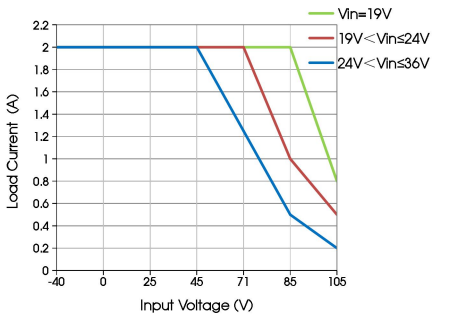
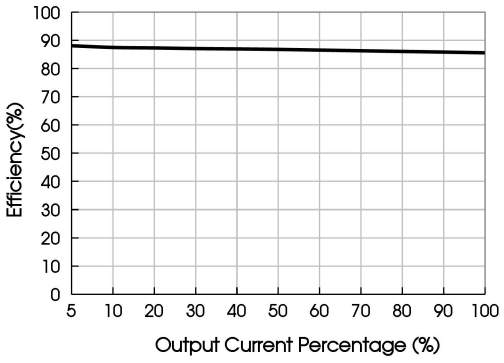
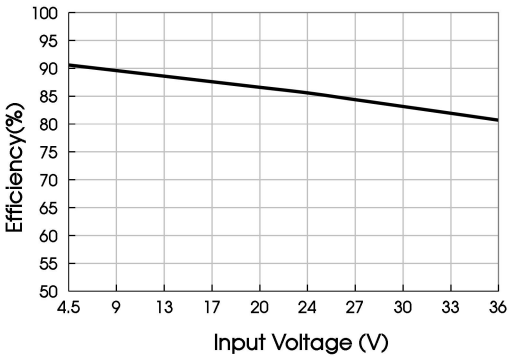


Fig. 1 Temperature derating curve

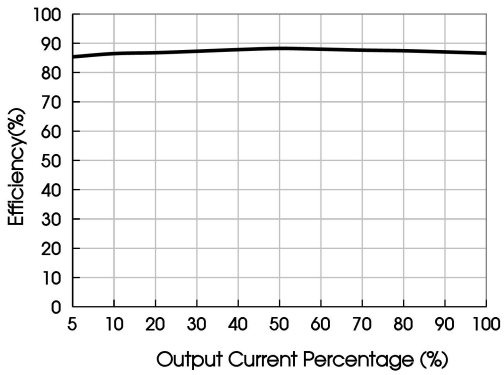
KAP24T-3A(Vo=2.5V)
Efficiency Vs Output Load (Vin=24V)



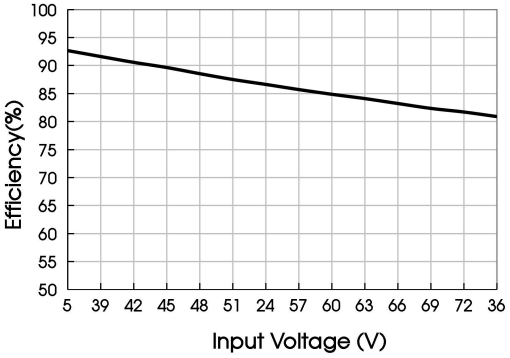
KAP24T-3A(Vo=2.5V)
Efficiency Vs Input Voltage (Full Load)



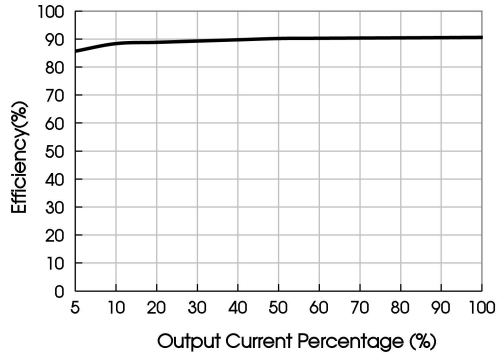
KAP2403T-3A
Efficiency Vs Output Load (Vin=24V)



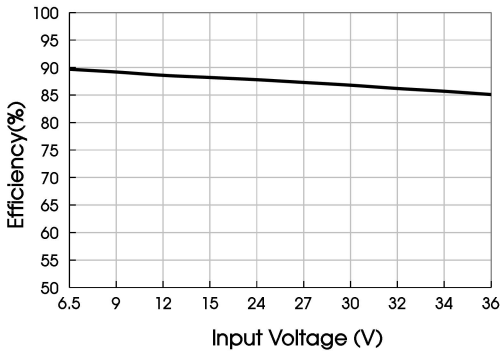
KAP2403T-3A
Efficiency Vs Input Voltage (Full Load)



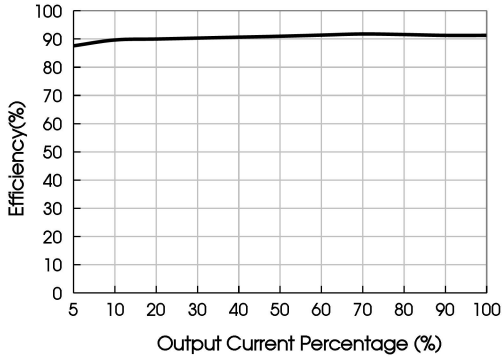
KAP2405T-3A
Efficiency Vs Output Load (Vin=24V)



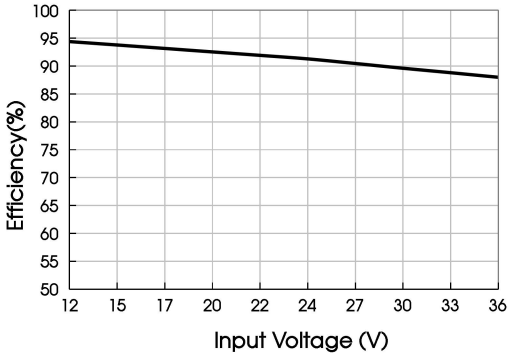
KAP2405T-3A
Efficiency Vs Input Voltage (Full Load)



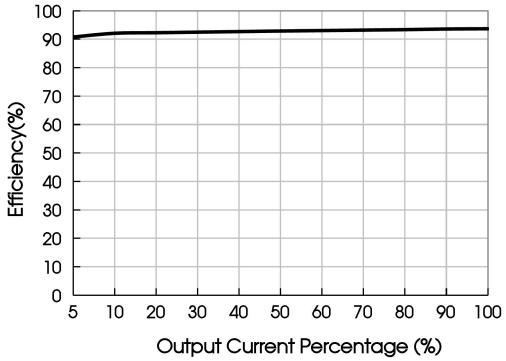
KAP24T-3A(Vo=9V)
Efficiency Vs Output Load (Vin=24V)



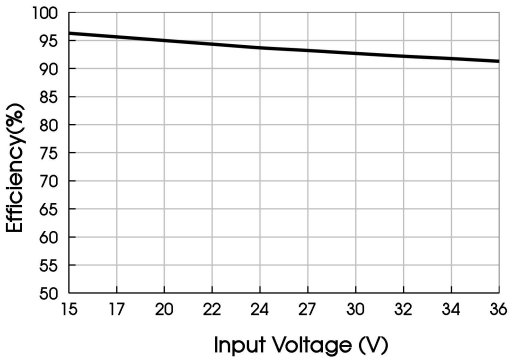
KAP24T-3A(Vo=9V)
Efficiency Vs Input Voltage (Full Load)



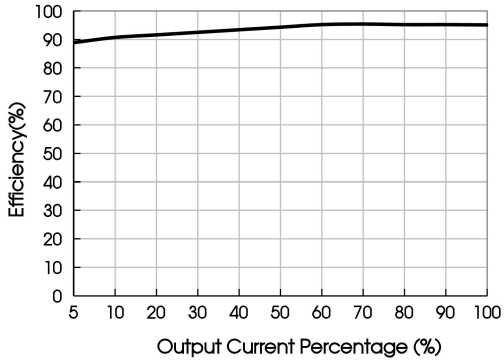
KAP24T-3A(Vo=12V)
Efficiency Vs Output Load (Vin=24V)



KAP24T-3A(Vo=12V)
Efficiency Vs Input Voltage (Full Load)



KAP24T-3A(Vo=16V)
Efficiency Vs Output Load (Vin=24V)



KAP24T-3A(Vo=16V)
Efficiency Vs Input Voltage (Full Load)

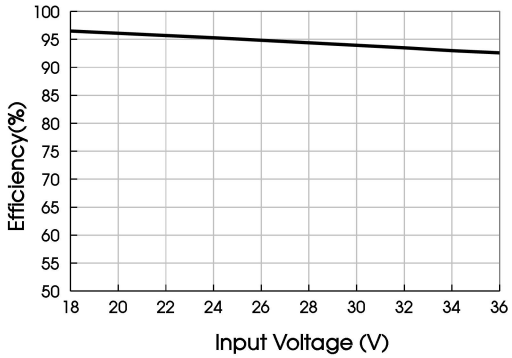


Fig. 2 Output efficiency characteristic curve

Design Reference

1. Typical application

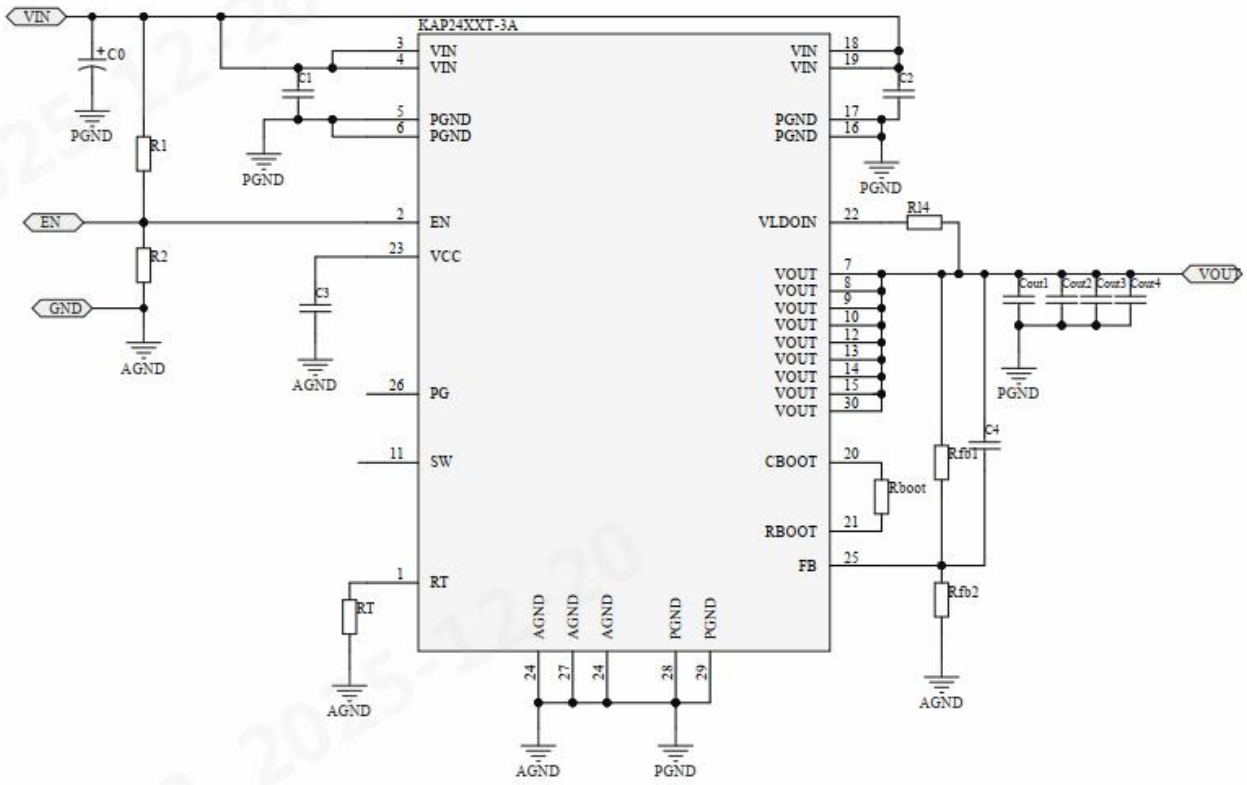


Fig. 3 Typical application circuit

Part No.	C1/C2 (ceramic capacitor)	C5/C6/C7/C8 (ceramic capacitor)	R1	R2/R3	R7	C9	R4	R6	R5	C10
KAP2405T-3A	4.7uF/50V	226k/25V	15kΩ	1MΩ	0Ω	1uF	27Ω	/	/	100pF
KAP2403T-3A	4.7uF/50V	226k/25V	15kΩ	1MΩ	/	1uF	27Ω	/	/	100pF
KAP24XXT-3A(1.0V)	4.7uF/50V	226k/25V	15kΩ	1MΩ	/	1uF	27Ω	0Ω	/	100pF
KAP24XXT-3A(2.5V)	4.7uF/50V*2	226k/25V	24kΩ	1MΩ	/	1uF	27Ω	15kΩ	10kΩ	100pF
KAP24XXT-3A(9V)	4.7uF/50V	226k/25V	12kΩ	1MΩ	0Ω	1uF	27Ω	12kΩ	1.5kΩ	100pF
KAP24XXT-3A(12V)	4.7uF/50V	226k/25V	12kΩ	1MΩ	0Ω	1uF	27Ω	11kΩ	1kΩ	100pF
KAP24XXT-3A(16V)	4.7uF/50V	226k/25V	12kΩ	1MΩ	0Ω	1uF	27Ω	15kΩ	1kΩ	100pF

Table 1. Recommended Peripheral Circuit Parameters

$$V_O = 1.0 \times (1 + \frac{R6}{R5})$$

Note:
1. Under normal circumstances, the position of C1/C2 capacitors should be close to the pin terminals of the product;
2. The capacitance values of C1 and C2 can be referred to Table 1. They can be appropriately increased as needed, or low ESR tantalum capacitors and electrolytic capacitors can be used;
3. This product does not support hot plugging, and the output terminals cannot be used in parallel.

2. EMC recommends peripheral circuits

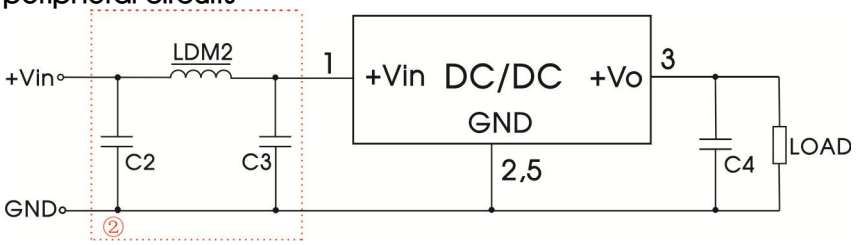


Fig. 4 Recommended peripheral circuits

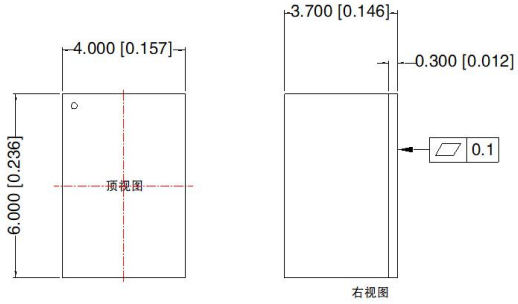
Table 2. Parameters of EMC Application Circuits

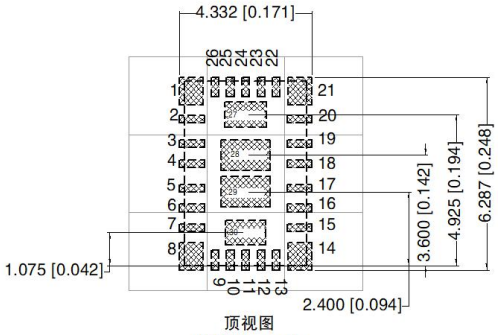
Part No.	C2	LDM2	C3	C4
KAP24XXT-3A	22μF/50V	22μH	22μF/50V	/

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

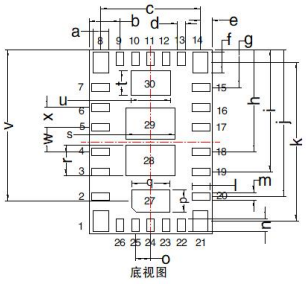
Dimensions and Recommended Layout

第三角投影





顶视图
(PCB Layout)
注： 栅格距离为2.54*2.54mm

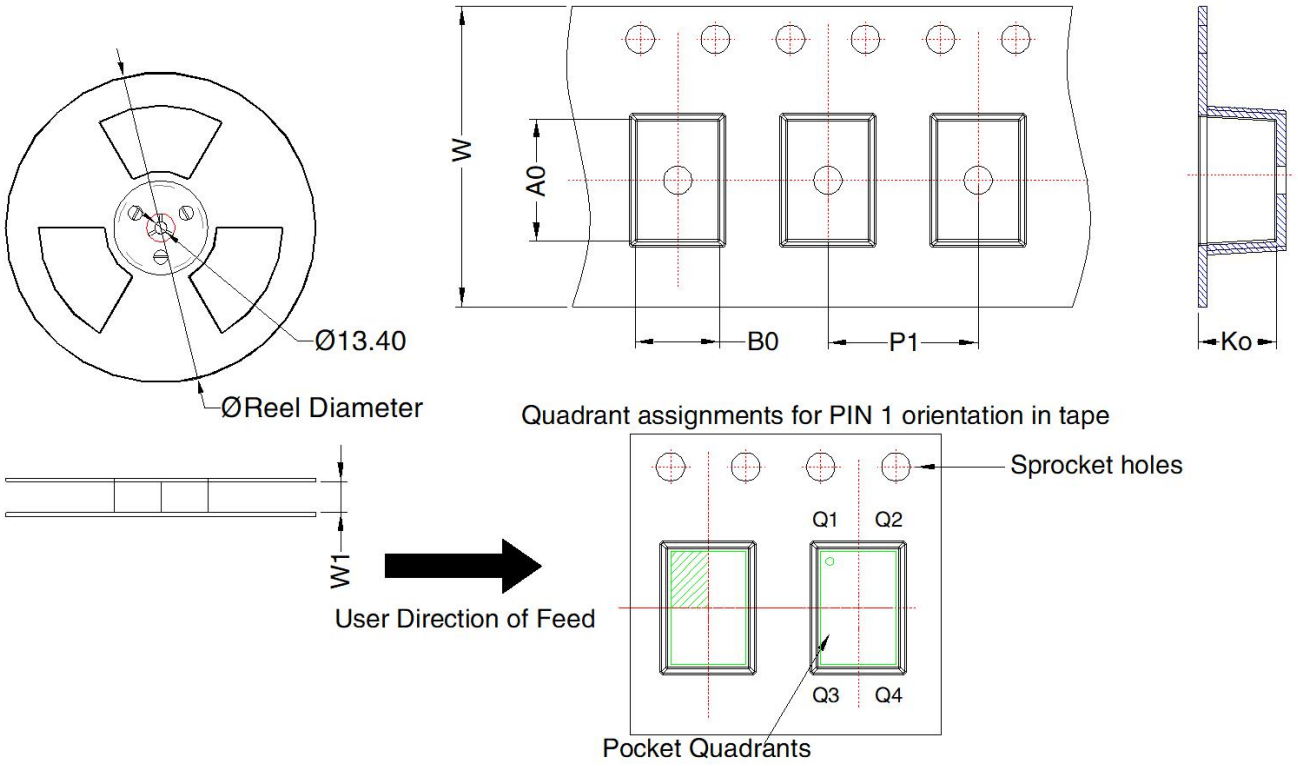


注:
尺寸单位： mm[inch]
未标注公差： ±0.1[±0.004]

引脚间距尺寸			
编号	数值	编号	数值
a	0.500[0.020]	m	0.250[0.010]
b	1.00[0.039]	n	0.425[0.017]
c	3.250[0.128]	o	0.500[0.020]
d	0.250[0.010]	p	0.740[0.029]
e	0.375[0.015]	q	1.250[0.049]
f	0.675[0.027]	r	1.000[0.039]
g	1.225[0.048]	s	1.600[0.063]
h	3.325[0.131]	t	0.8[0.031]
i	3.975[0.156]	u	1.300[0.051]
j	4.775[0.188]	v	4.925[0.194]
k	5.175[0.204]	w	0.800[0.031]
l	0.575[0.023]	x	0.650[0.026]

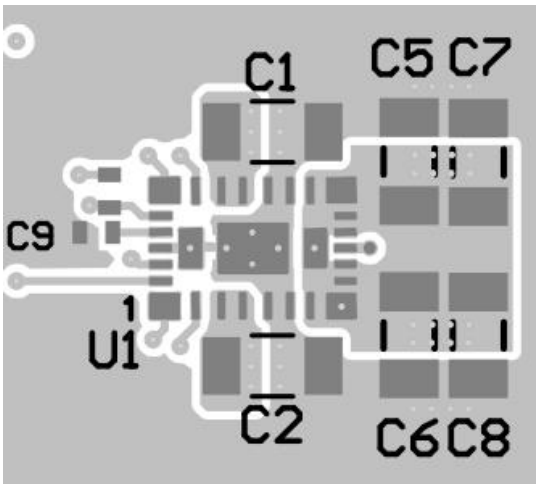
引脚方式			
引脚	功能	引脚	功能
1	RT	11	SW
2	EN	20	CBOOT
3,4, 18,19	VIN	21	RBOOT
		22	VLDOIN
5,6,16, 17,28,29	PGND	23	VCC
		24,27	AGND
7,8,9,10,12, 13,14,15,30	VOUT	25	FB
		26	PG

Tape/Reel packaging Recommended PCB layout



Device	Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
KAP24XXT-3A	FC-QFN	30	1000	178.0	16.4	6.5	4.5	4.2	8.0	16.0	Q1

Recommended PCB layout



Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Tape/Reel packaging bag number: XXXXXX;
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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