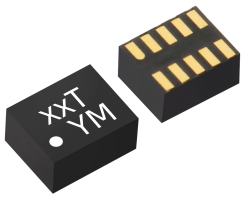
MORNSUN®

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



Patent Protection RoHS

FEATURES

- Ultra-small, ultra-thin DFN package(2.5*2*1.2 mm)
- Operating ambient temperature range: -40℃ to +85 ℃
- High efficiency up to 91%
- No-load input current as low as 0.3 mA
- Output short-circuit protection

KAP05XXT-1A series are 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)*	Output		Full Load Efficiency(%) Min./Typ.	Capacitive Load (μF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max.		
--	KAP05A1T-1A	5 2.5~5.5	1.2	1000	79/82	220
	KAP05X2T-1A	5 2.5~5.5	1.8	1000	81/84	220
	KAP0503T-1A	5 4.2~5.5	3.3	1000	87/91	47

Note: * For input voltage exceeding 6 VDC, the product will cause destructive damage.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (no-load)	Nominal input voltage	--	0.3	--	mA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			
Ctrl*	Module on	Ctrl pin pulled high TTL (1.4~5VDC)			
	Module off	Ctrl pin pulled low to GND (0~0.4VDC)			
	Input current when off	--	5	--	μA
Input Under-voltage Protection	Module under-voltage shutdown point	1.5	--	--	VDC
	Module under-voltage recovery point	--	--	2.3	

Note: *The ctrl pin voltage is referenced to input GND.

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Voltage Accuracy	Full load, input voltage range	--	±2	±3	%
Linear Regulation	Full load, input voltage range	--	30	60	
Load Regulation	Nominal input voltage, 0% -100% load	--	25	60	
Ripple & Noise*	20MHz bandwidth, nominal input voltage, full load	--	30	80	mVp-p
Temperature Coefficient	Operating temperature -40℃ to + 85℃	--	±0.02	--	%/℃
Transient Response Deviation	Nominal input voltage, 25% load step change	--	±40	±100	mV
Transient Recovery Time		--	100	500	ms
Short-circuit Protection		Short-circuit latch, restart for 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	--	85	℃
Storage Temperature		-55	--	125	
Storage Humidity	Non-condensing	5	--	95	%RH
Reflow Soldering Temperature		Peak temperature ≤245℃, duration ≤60s max. over 217℃. Also refer to IPC/JEDEC J-STD-020D.1.			
Switching Frequency	Full load, nominal input voltage, KAP05A1T-1A	--	6.5	--	MHz
	Full load, nominal input voltage, KAP05X2T-1A	--	10	--	
	Full load, nominal input voltage, KAP0503T-1A	--	8	--	
MTBF	MIL-HDBK-217F@25℃	2000	--	--	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.

Mechanical Specifications

Dimensions	2.5 x 2.0 x 1.2 mm
Weight	0.017g(Typ.)
Cooling Method	Free air convection

Typical Characteristic Curves

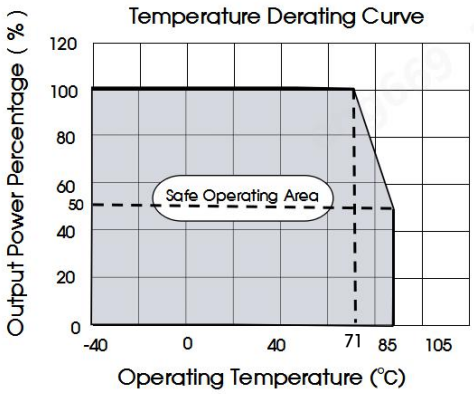
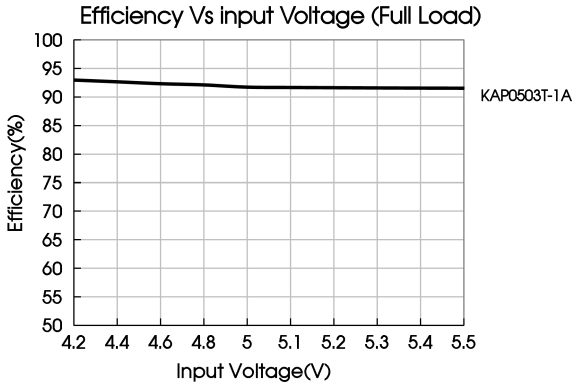
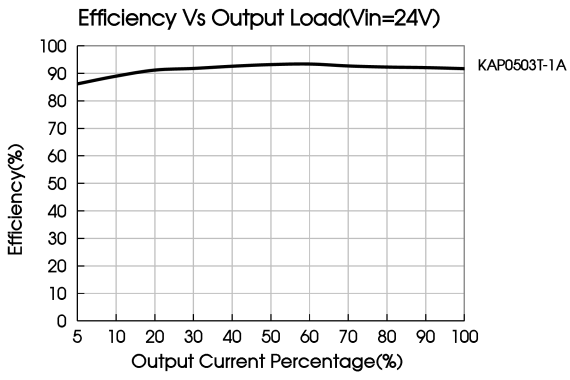


Fig. 1





Design Reference

1. Typical application

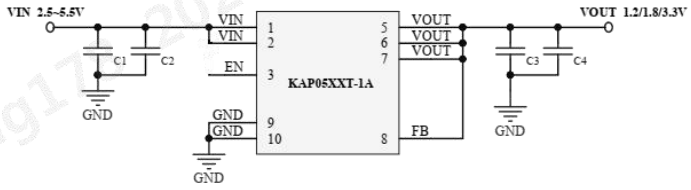


Fig. 2 Typical application circuit

Table 1

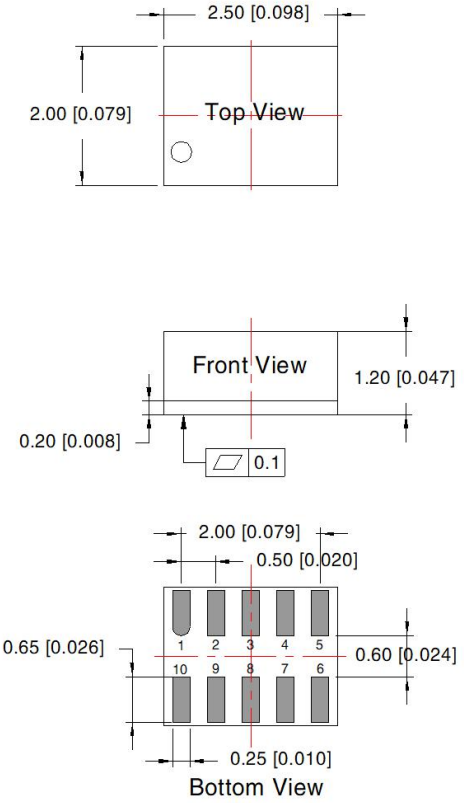
Part No.	C1/C4 (ceramic capacitor)	C2/C3 (ceramic capacitor)
KAP05A1T-1A	4.7uF/16V	0.1uF/16V
KAP05X2T-1A		
KAP0503T-1A		10nF/16V

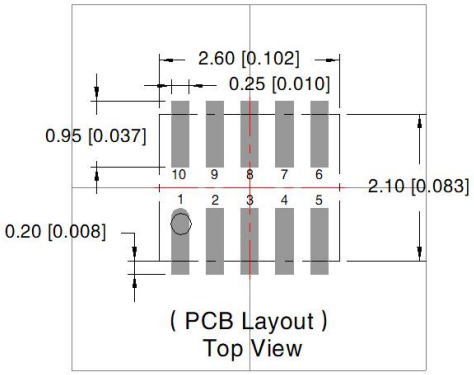
Notes:
1. The required C1 and C2 capacitors must be connected as close as possible to the terminals of the module;
2. Refer to Table 1 for C1 and C4 capacitor values. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead;
3. When the input voltage peak exceeds 6VDC, the input end needs to be connected to an external 47uF/16V electrolytic capacitor to prevent the module from being damaged by the voltage peak
4. 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

THIRD ANGLE PROJECTION



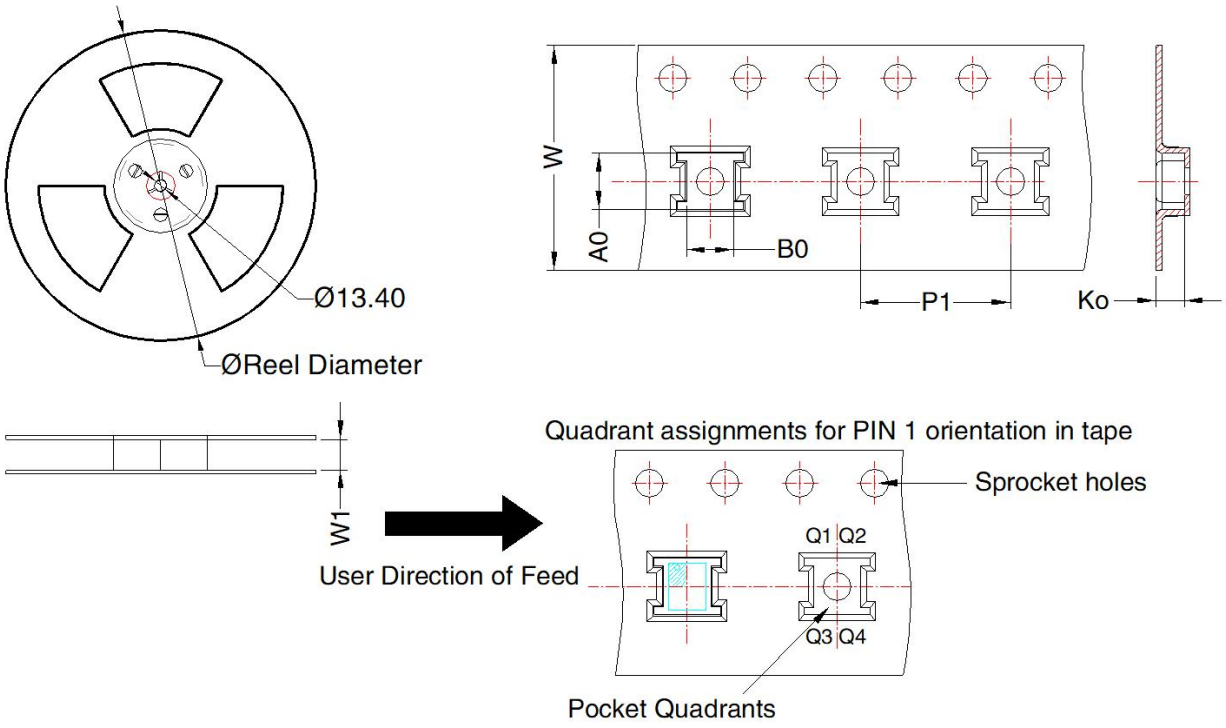


Note: Grid 2.54*2.54mm

Pin–Out			
Pin	Mark	Pin	Mark
1	VIN	6	VOUT
2	VIN	7	VOUT
3	EN	8	FB
4	NC	9	GND
5	VOUT	10	GND

Note:
Unit: mm[inch]
General tolerances: ± 0.10[± 0.004]

Tape/Reel packaging



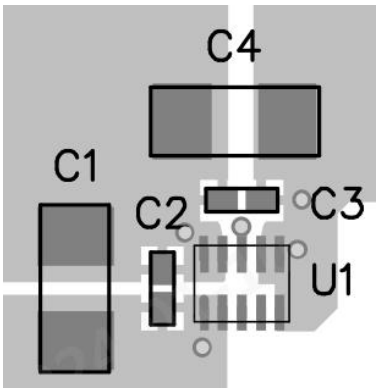
Device	Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
KAP05xxT–1A	DFN 2x2.5	8	1300	178.0	12.4	3.0	2.50	1.50	8.0	12.0	Q1

PCB Recommended layout

KAP05xxT-1A series switching frequency up to 10MHz, 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 C1/C2 as close as possible to VIN and GND.
- Keep the output capacitors C3/C4 as close as possible to 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: 58240114;
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";
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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