

# RM05S Series

0.5A, Non-isolated SIP Package Switching Regulators

## Features

- ▶ Rated current: 0.5A Max
- ▶ Non-isolated, step-down switching regulator
- ▶ Input range: 4.75~36VDC
- ▶ Regulated single output
- ▶ High efficiency up to 95%
- ▶ Low ripple and noise
- ▶ No load input current only 0.2mA typ.
- ▶ Operating temperature range: -40 ~ +85°C ambient
- ▶ RoHS compliant
- ▶ Compact SIP3 package
- ▶ Compatible with LM78 linear regulators
- ▶ Continuous short circuit protection
- ▶ Designed to meet: UL/EN/IEC 62368-1
- ▶ 3 year warranty



## Overview

The RM05S series are 0.5A rated non-isolated switching regulators, pin to pin compatible with LM78 family linear regulators. Unlike those linear regulators, the switching regulators are high efficiency. They do not need for any heatsinks because very little energy is wasted as heat. Besides, these converters accept ultra-wide input range, operate over wide ambient temperature range, and are continuous short circuit protected. These converters are especially suitable for applications where energy saving, space saving and high performance are essential.

## Model Numbers

Model Number	Input Voltage Range [VDC]			V <sub>OUT</sub> [VDC]	I <sub>OUT</sub> [mA] Max.	Efficiency [%] Typ.		Capacitive Load [uF] Max.
	Nominal	Min.	Max.			Min. V <sub>IN</sub>	Max. V <sub>IN</sub>	
RM05S-033	24	4.75	36	3.3	500	86	80	680
RM05S-050	24	6.5	36	5	500	90	84	680
	12	7	31	-5	-300	80	80	330
RM05S-090	24	12	36	9	500	93	90	680
RM05S-120	24	15	36	12	500	94	91	680
	12	8	24	-12	-150	85	84	330
RM05S-150	24	19	36	15	500	95	93	680
	12	8	21	-15	-150	87	85	330

\* Only typical models are listed. Contact our sales agent for availability of other models.

### Electrical Specifications

Unless otherwise indicated, specifications are measured at  $T_A=25^{\circ}\text{C}$ , nominal input voltage, full load after warm up.

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
No load input current	$V_{IN} = \text{Min. to Max.}$	-	0.2	1.5	mA	
Output voltage accuracy	$V_{OUT}=3.3\text{V}$	-	$\pm 2$	$\pm 4$	%	
Full load	Others		$\pm 2$	$\pm 3$		
Line regulation	$V_{IN} = \text{Min. to Max.}$	-	$\pm 0.2$	$\pm 0.4$	%	
Load regulation	$V_{OUT}=3.3, 5\text{V}$	-	$\pm 0.6$	-	%	
$I_{OUT} = 10\% \sim 100\%$	Others		$\pm 0.3$			
Temperature coefficient	$-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$	-	-	$\pm 0.03$	%/ $^{\circ}\text{C}$	
Output ripple and noise	20MHz bandwidth	-	20	75	mVp-p	
$I_{OUT} = 10\% \sim 100\%$						
Dynamic load response	Peak deviation	-	50	250	mV	
$I_{OUT}=25\% \sim 50\% \sim 75\%$ of $I_{OUT, \text{rated}}$	Recovery time		0.2	1	mS	
Output short circuit protection		Continuous, automatic recovery				
Reversed input		NOT protected				
Input filter		Capacitor				

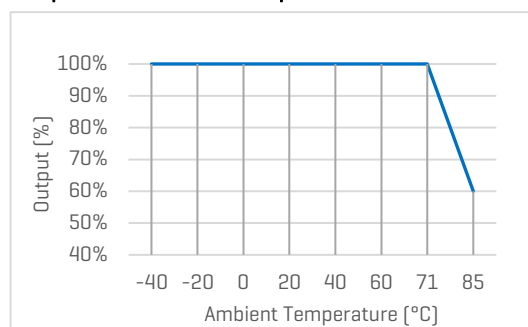
### General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Operating temperature	See "Derating Curve"	-40	-	+85	$^{\circ}\text{C}$	
Storage temperature		-55	-	+125	$^{\circ}\text{C}$	
Storage humidity	Non-condensing	5	-	95	%RH	
Switching frequency	Full load	550	-	850	KHz	
Pin soldering resistance		-	-	260	$^{\circ}\text{C}$	
1.5mm away from case for 10 sec						
Case material		Black plastic UL94-V0				
Design based on standards		UL/EN/IEC 62368-1				
Safety certifications		EN/IEC 62368-1				
EMC	Emissions	CISPR32, EN55032 Class B* [external circuit required]				
	Immunity	IEC/EN61000-4-2, 3, 4, 6				
MTBF	MIL-HDBK-217F	>2,000,000 Hours, $T_A=25^{\circ}\text{C}$				
Size & Weight		11.60 x 7.55 x 10.16 mm, 1.8g Typ.				

### Characteristic Curves

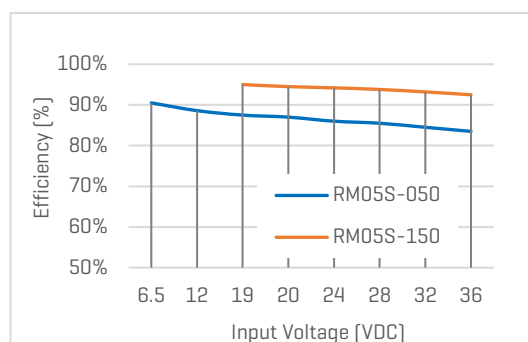
#### Derating Curve

##### Output vs Ambient Temperature



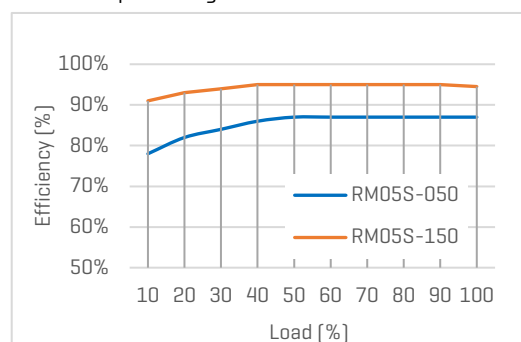
#### Efficiency vs Input Voltage

##### Full Load



#### Efficiency vs Load

##### Nominal input voltage



### Recommended External Circuit

#### Typical Application Circuit

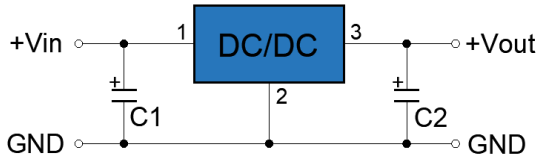


Figure 1: positive output application

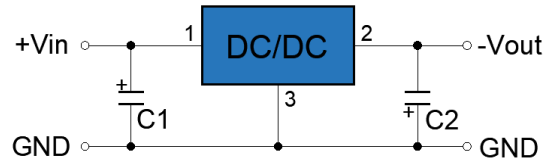


Figure 2: negative output application

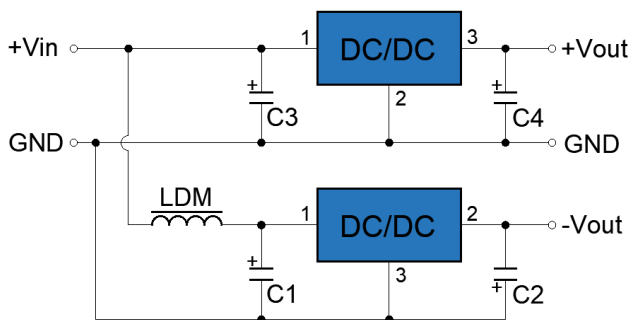


Figure 3: dual output application

#### Notes

1. C1, C2, C3, C4 are ceramic capacitors, and mandatory for operating of the converters. They can also be tantalum or low ESR electrolytic capacitors. Recommended specs listed in the table on right can be changed according to the needs in the circuits. Recommended LDM is 10uH.
2. The converter can be used both for positive and negative output using the circuit connection shown above.
3. These converters are not allowed to use in parallel or hot plug without support from properly designed external circuits.

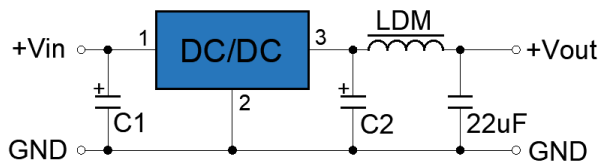
[Table 1] Recommended component specifications

Model Number	C1, C3	C2, C4
RM05S-033	10uF, 50V	22uF, 10V
RM05S-050	10uF, 50V	22uF, 10V
RM05S-090	10uF, 50V	22uF, 16V
RM05S-120	10uF, 50V	22uF, 25V
RM05S-150	10uF, 50V	22uF, 25V

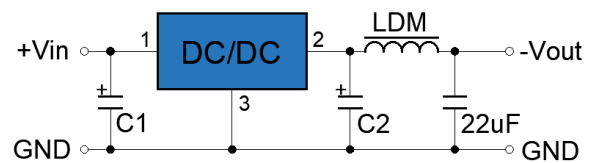
### Recommended External Circuit [continued]

#### Output Filtering Circuit

\* Connect "LC" filtering circuit as below can further reduce the output ripple. Recommended value for "L" is 10uH~47uH.



Positive output



Negative output

Figure 4, recommended output filtering circuit

#### Circuit for EMC Enhancement

\*Use this application circuit to meet Class B EMC performance.

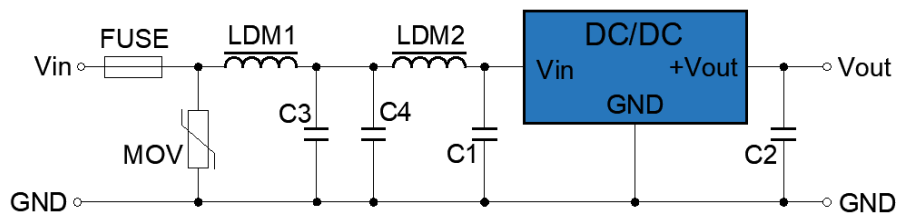


Figure 5: Circuit for EMC Enhancement

[Table 2] Recommended component spec

Component	MOV	LDM1	LDM2	C3	C4
Spec	20D470K	82uH	12uH	680uH, 50V	4.7uF, 50V

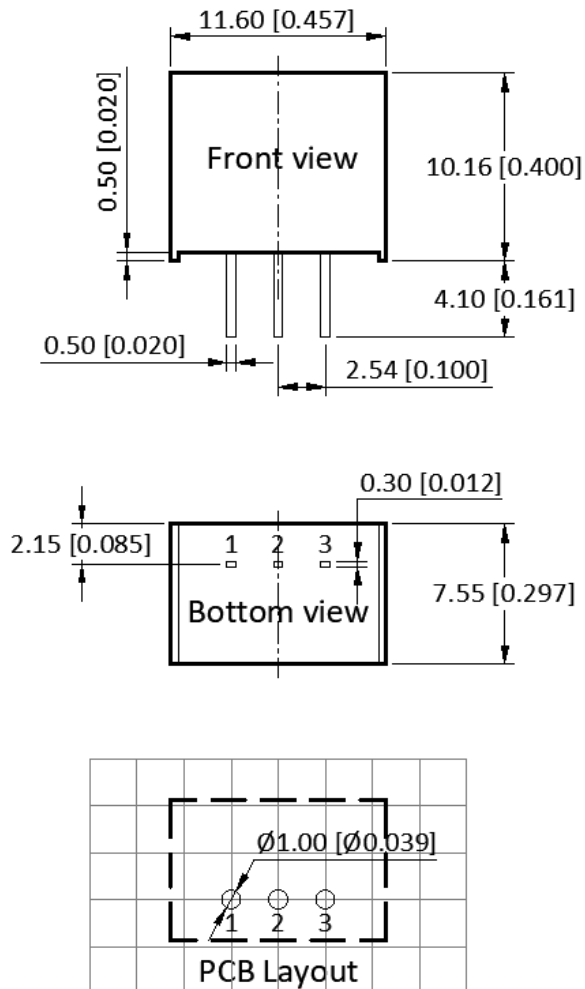
\*C1 & C2 Refer to the same in [Table 1]

\*Recommended component values are for reference only. They can be changed according to design needs.

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## Mechanical Specifications



### Pin Definition

Pin #	Positive Out	Negative Out
1	+V <sub>IN</sub>	+V <sub>IN</sub>
2	GND	-V <sub>OUT</sub>
3	+V <sub>OUT</sub>	GND

\* Unless otherwise specified unit: mm [inch]

\* General tolerance:  $\pm 0.50$  [ $\pm 0.020$ ]

\* Pin thickness tolerance:  $\pm 0.10$  [ $\pm 0.004$ ]

\* Footprint grid: 2.54 x 2.54 mm

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