

# MV20G Series

20W, Wide 2:1 Input Range, 1.5KV Isolation, DIP1"x1" Package DC/DC Converters

## Features

- ▶ Rated power: 20W Max
- ▶ Input voltage range 2:1
- ▶ Regulated single or dual out
- ▶ High efficiency up to 91%
- ▶ Isolation voltage 1.5KVDC
- ▶ Remote On/Off control
- ▶ Output trimming  $\pm 10\%$
- ▶ Operating temperature range: -40 ~ +85°C ambient
- ▶ RoHS compliant
- ▶ Compact 1"x1" package
- ▶ Under voltage, over voltage, over current, and short circuit protection
- ▶ Meet IEC/EN/UL 62368-1 CISPR32, EN55032
- ▶ 3 year warranty



## Overview

The MV20G series are 1.5KV isolated 20Watt DC/DC converters with standard DIP1"x1" footprint. Designed with high efficiency, they operate in a wide temperature range from -40°C to +85°C. Other features include wide 2:1 input voltage range, remote on/off control, under voltage, over voltage, over current, and short circuit protections. These converters are ideally suitable for battery operated equipment, measurement equipment, telecom, wireless network, industrial control system.

## Model Numbers

Model Number	Input Voltage [VDC]			V <sub>OUT</sub> [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [uF] Max.
	Nom.	Range	*Max.		Max.	Min.		
MV20G-1203	12	9~18	20	3.3	5000	0	86	10000
MV20G-1205	12	9~18	20	5.0	4000	0	89	10000
MV20G-1212	12	9~18	20	12	1667	0	89	1600
MV20G-1215	12	9~18	20	15	1333	0	89	1000
MV20G-1224	12	9~18	20	24	833	0	89	500
MV20G-1248	12	9~18	20	48	417	0	89	100
MV20G-1212D	12	9~18	20	$\pm 12$	$\pm 833$	0	90	800
MV20G-1215D	12	9~18	20	$\pm 15$	$\pm 667$	0	90	600
MV20G-1224D	12	9~18	20	$\pm 24$	$\pm 417$	0	90	300
MV20G-2403	24	18~36	40	3.3	5000	0	88	10000
MV20G-2405	24	18~36	40	5	4000	0	90	10000
MV20G-2412	24	18~36	40	12	1667	0	90	1600
MV20G-2415	24	18~36	40	15	1333	0	91	1000
MV20G-2424	24	18~36	40	24	833	0	91	500
MV20G-2405D	24	18~36	40	$\pm 5$	$\pm 833$	0	90	800
MV20G-2412D	24	18~36	40	$\pm 12$	$\pm 667$	0	90	600
MV20G-2415D	24	18~36	40	$\pm 15$	$\pm 417$	0	90	300

# MV20G Series

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## Model Numbers [continued]

Model Number	Input Voltage [VDC]			V <sub>OUT</sub> [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [uF] Max.
	Nom.	Range	*Max.		Max.	Min.		
MV20G-4803	48	36~75	80	3.3	5000	0	88	4700
MV20G-4805	48	36~75	80	5	4000	0	90	2200
MV20G-4812	48	36~75	80	12	1667	0	91	330
MV20G-4815	48	36~75	80	15	1333	0	91	220
MV20G-4824	48	36~75	80	24	833	0	91	500
MV20G-4805D	48	36~75	80	±5	±833	0	90	800
MV20G-4812D	48	36~75	80	±12	±667	0	90	600
MV20G-4815D	48	36~75	80	±15	±417	0	90	300

\* Only typical models are listed. Other models may be available upon request.

\* Input voltage exceed the Max. value may cause permanent damage.

### 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
Input voltage surge 1 second max	$V_{IN, Nom} = 12\text{V}$	-0.7	-	25	VDC	
	$V_{IN, Nom} = 24\text{V}$	-0.7	-	50		
	$V_{IN, Nom} = 48\text{V}$	-0.7	-	100		
Startup input voltage	$V_{IN, Nom} = 12\text{V}$	-	-	9.0	VDC	
	$V_{IN, Nom} = 24\text{V}$	-	-	18		
	$V_{IN, Nom} = 48\text{V}$	-	-	36		
Input under voltage shutdown	$V_{IN, Nom} = 12\text{V}$	5.5	6.5	-	VDC	
	$V_{IN, Nom} = 24\text{V}$	12	15.5	-		
	$V_{IN, Nom} = 48\text{V}$	26	30	-		
Startup time			10		mS	
Remote On/Off control “Ctrl” pin open or logic high [ON] “Ctrl” pin grounded or logic low [OFF]	Logic high	3.5	-	12	VDC	Positive Logic
	Logic low	0	-	1.2	VDC	
	Ctrl pin current	-	2	7	mA	
Output voltage accuracy	$I_{OUT}=0$ to 100%	-	$\pm 1$	$\pm 3$	%	
Line regulation Full load, $V_{IN}=V_{IN, Min}$ to $V_{IN, Max}$	Main Out	-	$\pm 0.2$	$\pm 0.5$	%	
	Others	-	$\pm 0.5$	$\pm 1.0$	%	
Load regulation $I_{OUT}=5\%$ to 100% of $I_{OUT, rated}$	Main Out	-	$\pm 0.5$	$\pm 1.0$	%	
	Others	-	$\pm 0.5$	$\pm 1.5$	%	
Cross regulation $+I_{OUT}=50\%$ , $-I_{OUT}=10\%$ to 100%	Dual output models	-	-	$\pm 5$	%	
Output ripple and noise 20MHz bandwidth, peak to peak		-	50	100	mVp-p	
Temperature coefficient	Full load	-	-	$\pm 0.03$	%/ $^{\circ}\text{C}$	
Dynamic load response $I_{OUT}=25\% \sim 50\% \sim 75\%$ of $I_{OUT, rated}$	Peak deviation	-	$\pm 5$	$\pm 8$	% $V_{OUT}$	
	Recovery time	-	300	500	$\mu\text{S}$	
Output voltage trim	Trim range	-	-	$\pm 10$	% $V_{OUT}$	
Output over voltage protection		110		160	% $V_{OUT}$	
Output over current protection		110	150	190	% $I_{OUT}$	
Output short circuit protection		Continuous, automatic recovery				
Input filter		PI filter				
Hot plug		None				

\* Operating with less than 5% of rated load will not cause damage to the converters, but the performances data may not fall into the specifications, and stable operating is not assured.

## General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
<b>Isolation voltage</b> 1 minute, leakage current 1mA max.	I/P to O/P	1500	-	-	VDC	
<b>Isolation resistance</b> Tested at 500VDC	I/P to O/P	1000	-	-	M ohm	
<b>Isolation capacitance</b> 100KHz, 0.1V	I/P to O/P	-	1000	-	pF	
<b>Switching frequency</b>	Full load	-	300	-	KHz	PWM mode
<b>Operating temperature</b>		-40	-	+85	°C	
<b>Storage temperature</b>		-55	-	+125	°C	
<b>Storage humidity</b>	None condensing	5	-	95	%RH	
<b>Pin soldering resistance</b> 1.5mm away from case for 10 sec		-	-	+300	°C	
<b>Cooling method</b>		Free air convection				
<b>Case material</b>		Aluminum alloy				
<b>Vibration</b>		IEC/EN61373 – Category 1, Grade B				
<b>MTBF</b>	MIL-HDBK-217F	>1,000,000 Hours, T <sub>A</sub> =25°C				
<b>Design based on standards</b>		UL/EN/IEC 62368-1				
<b>Safety certifications</b>		EN/IEC 62368-1				
<b>EMC</b>		CISPR32, EN55032 Class B with external circuit IEC/EN61000-4-2, 3, 4, 5, 6				
<b>Size, and Weight</b>		25.4 x 25.4 x 12mm, 16g				

\* Switching frequency is measured at full load. The converter reduces the switching frequency at low load [less than 50% load] for better efficiency.

# MV20G Series

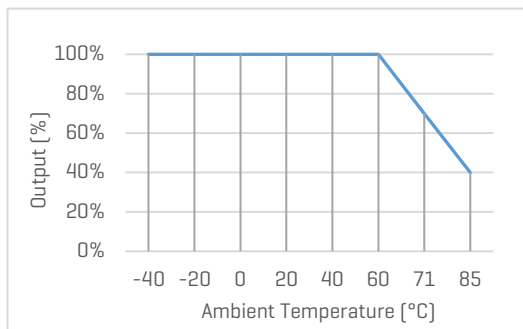
20W, Wide 2:1 Input Range, 1.5KV Isolation, DIP1"X1" Package DC/DC Converters

## Characteristic Curves

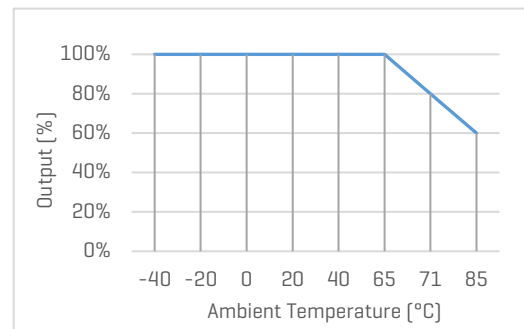
### Derating Curve

#### Output vs Ambient Temperature

$V_{OUT}=3.3 \dots 5V$



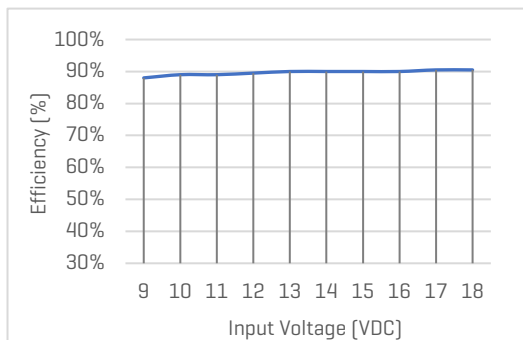
$V_{OUT}=12 \dots 48V$



### Efficiency Curve

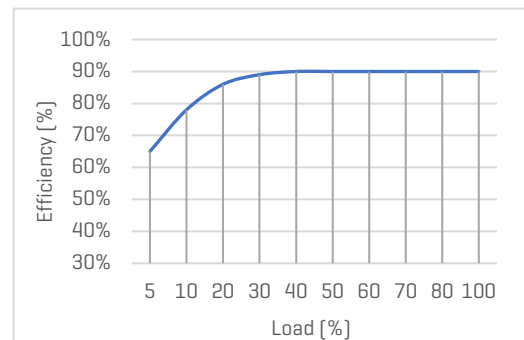
#### Efficiency vs Input Voltage

MV20G-1205, with full Load

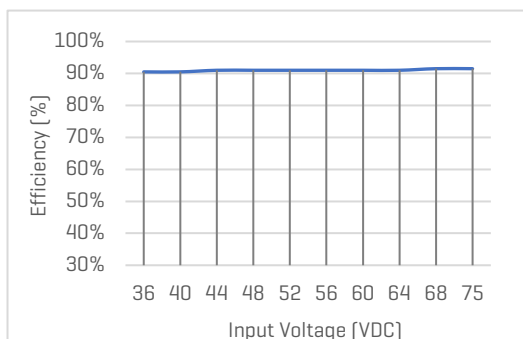


#### Efficiency vs Load

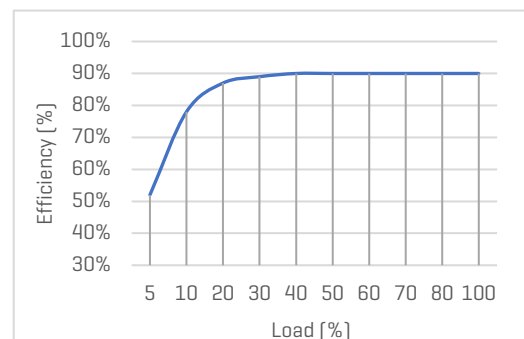
MV20G-1212, with full Load



MV20G-2405, with full Load



MV20G-2415, with full Load



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## Recommended Application Circuit

### Typical Application Circuit

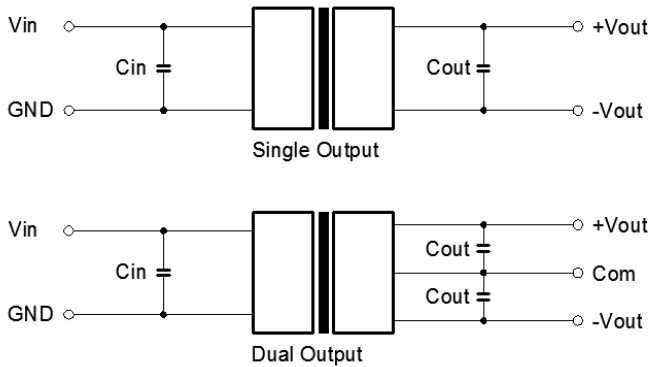


Figure 1. Typical external circuit

#### Note

\*Typical application circuit is to further lower the input and output ripple. It is not required for general use.

\*Recommended component specifications are typical values. Excessive external capacitive load may cause startup problem.

[Table 1] Recommended component spec

$C_{IN}$	100uF
$C_{OUT}$	47...100uF

### EMC Enhancement for EN55032 Class B

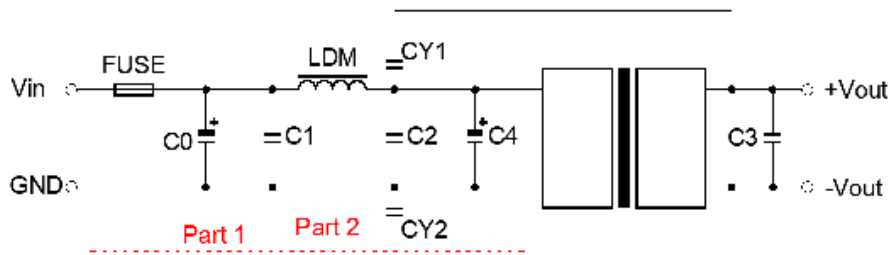


Figure 2. Circuit for EMC enhancement

[Table 2] Recommended component spec

Item	LDM	C0, C4	C1, C2	CY1, CY2
Spec	2.2uH	330uF, 100V	4.7uF, 100V	1nF, 2KV

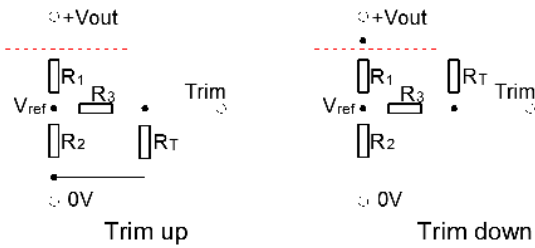
\* Fuse to be selected according to application needs.

\* C3 refer to relative  $C_{OUT}$  values in Table 1.

## Recommended Application Circuit [continued]

### Circuits for Output Trim

\* Items in the red blocks are internal components of the converter.



\* The formulas to calculate the desired resistance of Trim resistor “ $R_T$ ”.

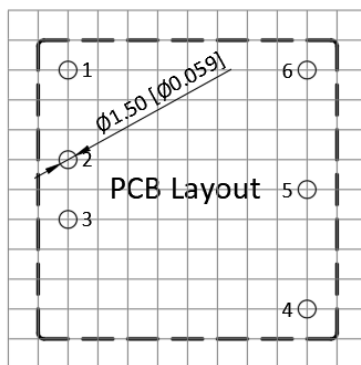
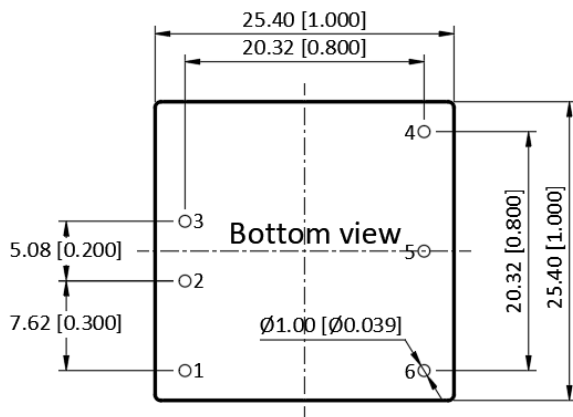
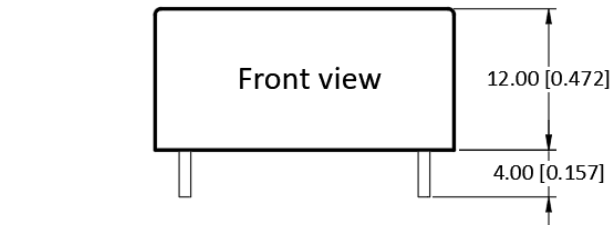
$$\text{Trim up: } R_T = \frac{a R_2}{R_2 - a} - R_3 \quad a = \frac{V_{ref}}{V_{OUT} - V_{ref}} R_1$$

$$\text{Trim down: } R_T = \frac{a R_1}{R_1 - a} - R_3 \quad a = \frac{V_{OUT} - V_{ref}}{V_{ref}} R_2$$

[Table 3] Internal component spec

$V_{OUT}$ [V]	R1 [K Ohm]	R2 [K Ohm]	R3 [K Ohm]	$V_{ref}$ [V]
3.3	10	6.064	13.622	1.24
5	2.4	2.344	17.346	2.5
12	8.2	2.153	21.016	2.5
15	12	2.388	21.016	2.5
24	10	1.158	10.714	2.5

## Mechanical Specifications



### Pin Definition

Pin #	Single Out	Dual Out
1	Ctrl	Ctrl
2	GND	GND
3	V <sub>IN</sub>	V <sub>IN</sub>
4	+V <sub>OUT</sub>	+V <sub>OUT</sub>
5	Trim	0V
6	0V	-V <sub>OUT</sub>

\* Unless otherwise specified unit: mm [inch]

\* General tolerance: ±0.50 [±0.020]

\* Pin thickness: ±0.10 [±0.004]

\* Footprint grid 2.54 x 2.54 mm

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