

# MQ2S Series

Unregulated DC/DC Converters Dedicated to IGBT Drivers

## Features

- ▶ Input voltage range  $\pm 10\%$
- ▶ Unregulated output
- ▶ High efficiency, up to 80%
- ▶ Isolation 4000VAC
- ▶ Low Isolation capacitance 3.5pF Typ.
- ▶ Operating temperature range:  $-40 \sim +105^{\circ}\text{C}$  ambient
- ▶ RoHS compliant
- ▶ Compact SIP7 package
- ▶ Continuous short circuit protection
- ▶ Meet UL/EN/IEC 62368-1
- ▶ 5 year warranty
- ▶ Dedicated to use in IGBT Driver applications



## Overview

The MQ2S series are unregulated SIP7 package DC/DC converters dedicated to IGBT driver applications. The series has unbalanced dual output voltage, in order to minimize the IGBT driver lose. The models also have continuous short circuit protection. The typical applications of these converters are transducers, AC servo drive system, electric welding, and UPS.

## Model Numbers

Model Number	Input Voltage [VDC]			V <sub>OUT1</sub> , V <sub>OUT2</sub> [VDC]	I <sub>OUT1</sub> , I <sub>OUT2</sub> [mA] Max.	Efficiency [%] Typ.	Capacitive Load [uF] Max.
	Nom.	Min	Max				
MQ2S-12E15035	12	10.8	13.2	+15, -3.5	+111, -111	80	220
MQ2S-12E20040	12	10.8	13.2	+20, -4.0	+100, -100	80	220
MQ2S-12E20050	12	10.8	13.2	+20, -5.0	+100, -100	80	220
MQ2S-15E15025	15	13.5	16.5	+15, -2.5	+100, -100	80	220
MQ2S-15E15040	15	13.5	16.5	+15, -4.0	+100, -100	80	220
MQ2S-15E15080	15	13.5	16.5	+15, -8.0	+120, -120	80	220
MQ2S-15E15087	15	13.5	16.5	+15, -8.7	+100, -100	80	220
MQ2S-15E18030	15	13.5	16.5	+18, -3.0	+100, -100	80	220
MQ2S-15E20040	15	13.5	16.5	+20, -4.0	+100, -100	80	220
MQ2S-15E20050	15	13.5	16.5	+20, -5.0	+100, -100	80	220
MQ2S-24E15040	24	21.6	26.4	+15, -4.0	+100, -100	80	220
MQ2S-24E20040	24	21.6	26.4	+20, -4.0	+100, -100	80	220

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## 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
<b>Surge voltage</b>	1 second max	-0.7	-	30	VDC	
<b>Output voltage accuracy</b>	All models	Refer to graphic in "Characteristic Curves" section				
<b>Line regulation</b> For $V_{IN}$ change of $\pm 1\%$		-	$\pm 1.2$	-	%	
<b>Load regulation</b> $I_{OUT}=10\%$ to $100\%$ of $I_{OUT, rated}$	$+V_{OUT}$ $-V_{OUT}$	-	5 10	12 20	%	
<b>Temperature coefficient</b>	Full load	-	$\pm 0.02$	$\pm 0.03$	%/ $^{\circ}\text{C}$	
<b>Output ripple and noise</b>	20MHz bandwidth	-	100	150	mVp-p	
<b>Output short circuit protection</b>		Continuous, automatic recovery				
<b>Input filter</b>		Capacitor				
<b>Hot plug</b>		None				

## General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
<b>Isolation voltage</b> 1 minute, leakage current 1mA Max	I/P to O/P	4000	-	-	VAC	
<b>Isolation resistance</b> 500VDC	I/P to O/P	1000	-	-	M ohm	
<b>Isolation capacitance</b> 100KHz, 0.1V	I/P to O/P	-	3.5	-	pF	
<b>Operating temperature</b>	See "Derating Curve"	-40	-	+105	$^{\circ}\text{C}$	
<b>Storage temperature</b>		-55	-	+125	$^{\circ}\text{C}$	
<b>Temperature rise at case</b>	Full load	-	25	-	$^{\circ}\text{C}$	
<b>Storage humidity</b>	Non-condensing	5	-	95	%RH	
<b>Switching frequency</b>	Full load	-	100	-	KHz	
<b>Pin soldering resistance</b> 1.5mm away from case for 10 sec		-	-	300	$^{\circ}\text{C}$	
<b>Vibration</b>		10-150Hz, 5G, 0.75mm along X, Y and Z				
<b>Case material</b>		Black plastic UL94-V0				
<b>Cooling method</b>		Free air convection				
<b>Design based on standards</b>		UL/EN/IEC 62368-1				
<b>EMC</b>		CISPR32, EN55032 Class B* with external circuit				
<b>MTBF</b>	MIL-HDBK-217F	>35,000,000 Hours, $T_A=25^{\circ}\text{C}$				
<b>Size &amp; Weight</b>		19.50 x 9.80 x 12.50 mm, 4.2g Typ.				

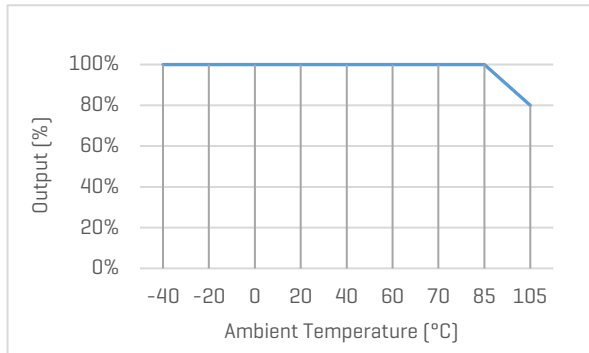
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## Characteristic Curves

### Derating Curve

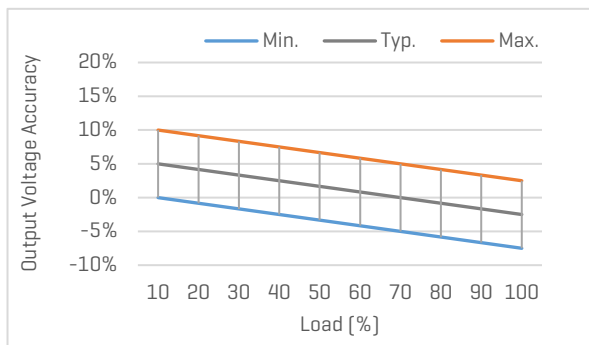
Output vs Ambient Temperature



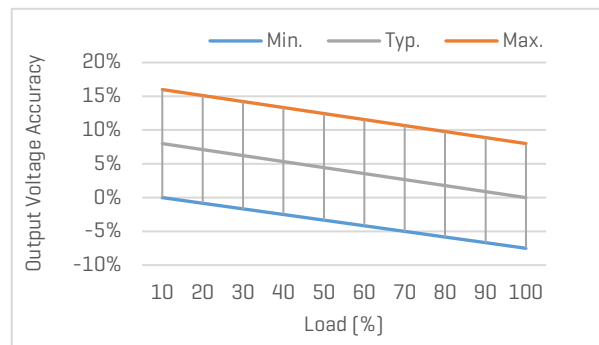
### Output Voltage Accuracy

Output Voltage Accuracy vs Load

+V<sub>OUT</sub> with nominal input voltage



-V<sub>OUT</sub> with nominal input voltage



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## Recommended External Circuit

### Typical Application Circuit

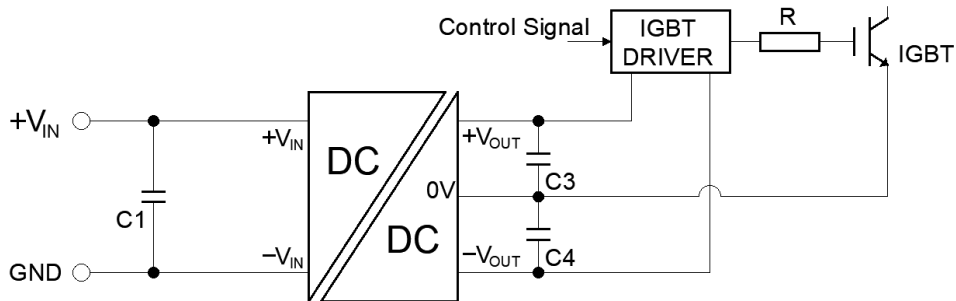


Figure 1. Typical Application Circuit

### [Table 1] Recommended component spec

Item	C1	C3, C4
C <sub>IN</sub>	100uF, 35V	100uF, 35V

\*Connect a ceramic capacitor [1~10uF] in parallel with C3 and C4 can reduce ripple and noise.

### EMC Enhancement for EN55032 Class B

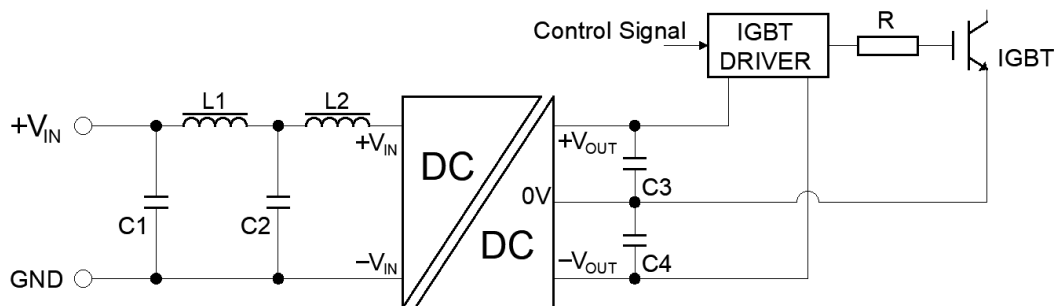


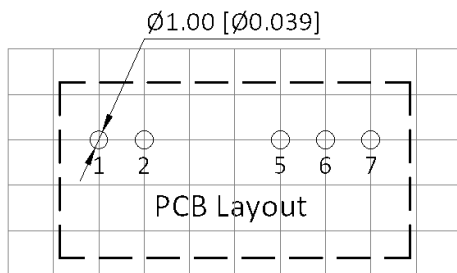
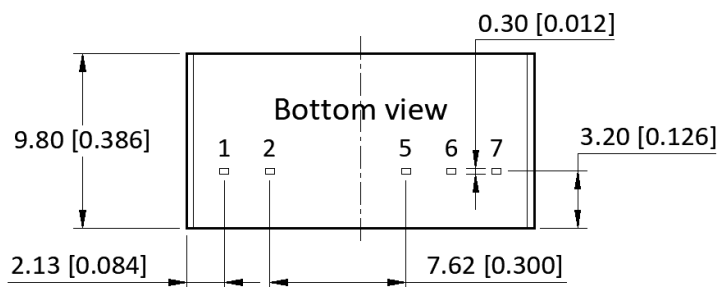
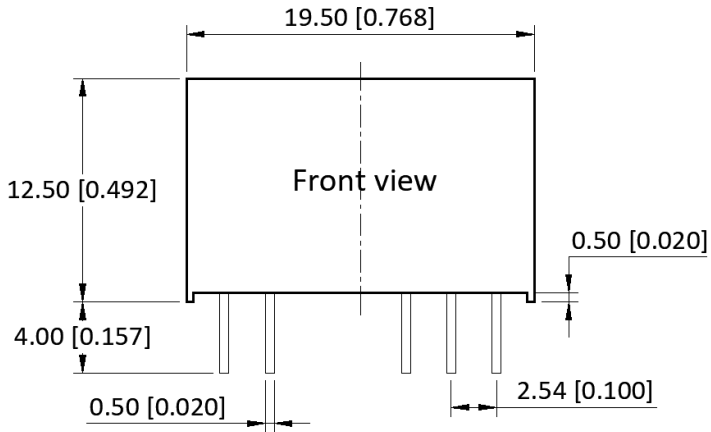
Figure 2. Circuit for EMC enhancement

### [Table 2] Recommended component spec

Item	C1, C2	L1	L2
C <sub>IN</sub>	4.7uF, 50V	12uH	47uH

\*Refer to Table 1 for output circuits

## Mechanical Specifications



### Pin Definition

Pin #	Dual Out
1	$V_{IN}$
2	GND
5	$-V_{OUT}$
6	0V
7	$+V_{OUT}$

\* Unless otherwise specified unit: mm [inch]

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

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

\* Footprint grid 2.54 x 2.54 mm