MQ1S Series

Unregulated DC/DC Converters Dedicated to IGBT Drivers

Features

- Input voltage range ±10%
- Unregulated output
- High efficiency, up to 80%
- Isolation 4000VAC
- Low Isolation capacitance 6.6pF Typ.
- Operating temperature range: -40 ~ +105°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 MQ1S 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]			$V_{OUT}1$, $V_{OUT}2$ [VDC]	$I_{OUT}1$, $I_{OUT}2$ [mA] Max.	Efficiency [%] Typ.	Capacitive Load [uF] Max.
	Nom.	Min	Max				
MQ1S-05E20040	5	4.5	5.5	+20, -4.0	+80, -40	80	220
MQ1S-12V15080	12	9.0	15.0	+15, -8.0	+100, -80	80	220
MQ1S-12E15087	12	11.6	12.4	+15, -8.7	+80, -40	80	220
MQ1S-15E09090	15	14.5	15.5	+9, -9.0	+55, -55	80	220
MQ1S-15E15087	15	14.5	15.5	+15, -8.7	+80, -40	80	220
MQ1S-15E17087	15	14.5	15.5	+17, -8.7	+80, -40	80	220
MQ1S-24E15087	24	23.3	24.7	+15, -8.7	+80, -40	80	220

Electrical Specifications

Unless otherwise indicated, specifications are measured at T_A=25°C, nominal input voltage, full load after warm up.

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Surge voltage 1 second max	V_{IN}=5V V_{IN}=12V V_{IN}=24V	-0.7 -0.7 -0.7	-	16 13 26	VDC	
Output voltage accuracy	All models	Refer to graphic in "Characteristic Curves" section				
Line regulation For V_{IN} change of ±1%		-	-	±1.5	%	
Load regulation I_{OUT}=10% to 100% of $I_{OUT, rated}$	+V_{OUT} -V_{OUT}	-	8 10	15 20	%	

Electrical Specifications

Unless otherwise indicated, specifications are measured at T_A=25°C, nominal input voltage, full load after warm up.

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Temperature coefficiency	Full load	-	±0.02	±0.03	%/°C	
Output ripple and noise	20MHz bandwidth	-	100	200	mVp-p	
Output short circuit protection		Continuous, automatic recovery				
Input filter		Capacitor				
Hot plug		None				

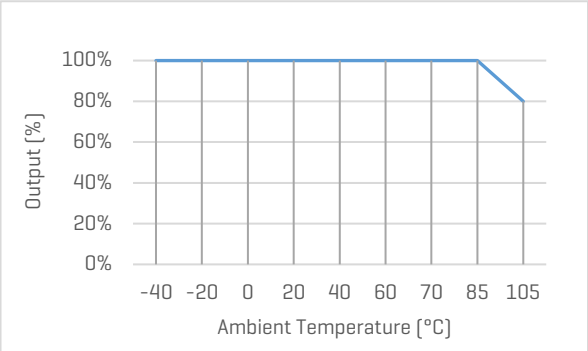
General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Isolation voltage 1 minute, leakage current 1mA Max	I/P to O/P	4000	-	-	VAC	
Isolation resistance 500VDC	I/P to O/P	1000	-	-	M ohm	
Isolation capacitance 100KHz, 0.1V	I/P to O/P	-	6.6	-	pF	
Operating temperature	See "Derating Curve"	-40	-	+105	°C	
Storage temperature		-55	-	+125	°C	
Temperature rise at case	Full load	-	25	-	°C	
Storage humidity	Non-condensing	5	-	95	%RH	
Switching frequency	Full load	-	100	-	KHz	
Pin soldering resistance 1.5mm away from case for 10 sec		-	-	300	°C	
Vibration		10-150Hz, 5G, 0.75mm along X, Y and Z				
Case material		Black plastic UL94-V0				
Cooling method		Free air convection				
Design based on standards		UL/EN/IEC 62368-1				
EMC		CISPR32, EN55032 Class B* with external circuit				
MTBF	MIL-HDBK-217F	>35,000,000 Hours, T_A=25°C				
Size & Weight		19.50 x 9.80 x 12.50 mm, 4.2g Typ.				

Characteristic Curves

Derating Curve

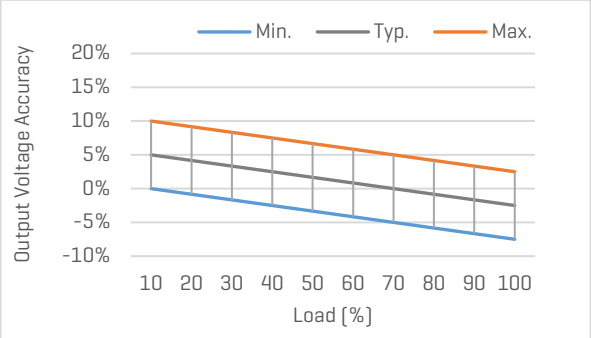
Output vs Ambient Temperature



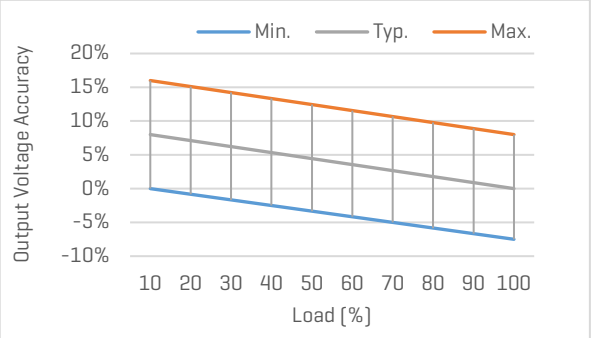
Output Voltage Accuracy

Output Voltage Accuracy vs Load

$+V_{OUT}$ with nominal input voltage



$-V_{OUT}$ with nominal input voltage



Recommended External Circuit

Typical Application Circuit

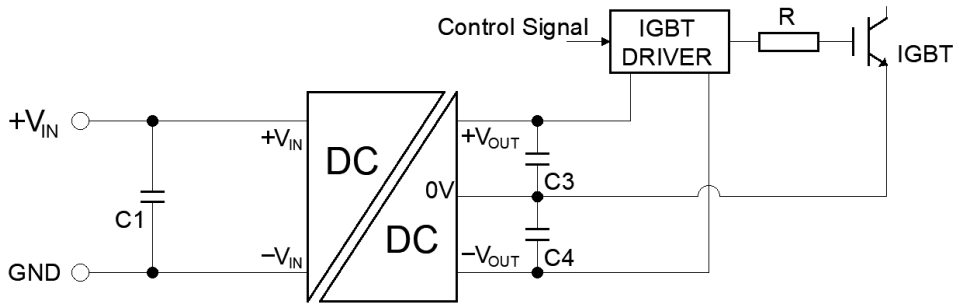


Figure 1. Typical Application Circuit

[Table 1] Recommended component spec

Item	C1	C3, C4
C_{IN}	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

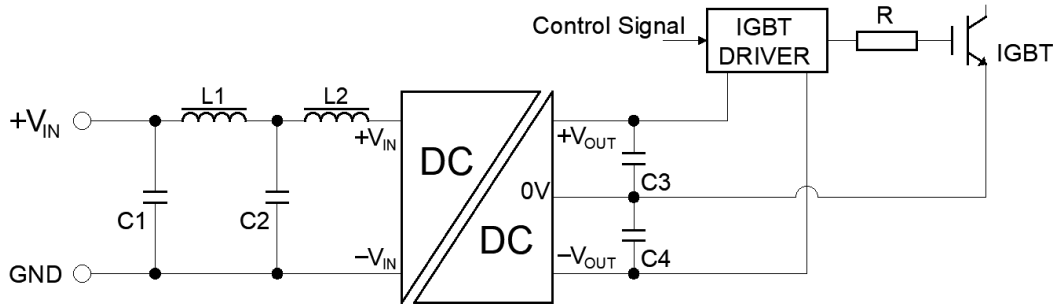


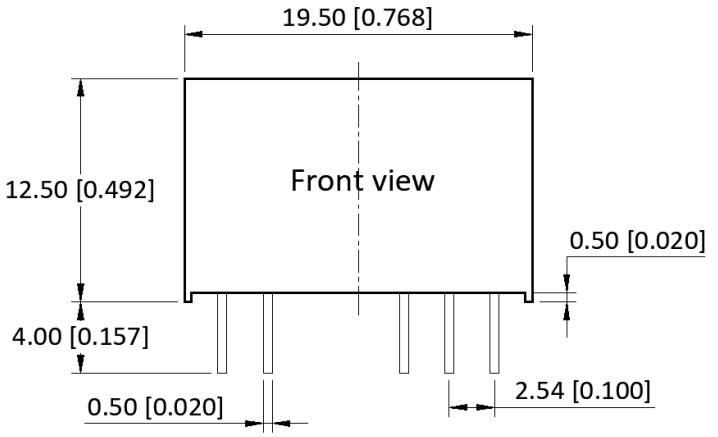
Figure 2. Circuit for EMC enhancement

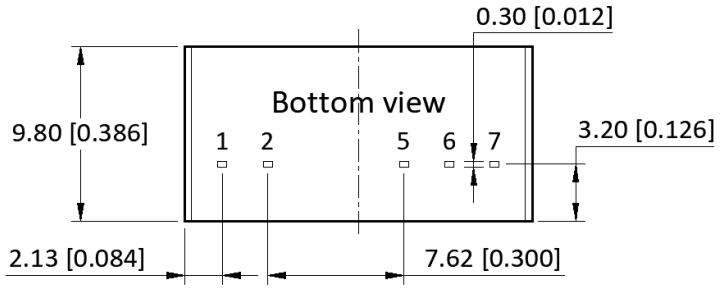
[Table 2] Recommended component spec

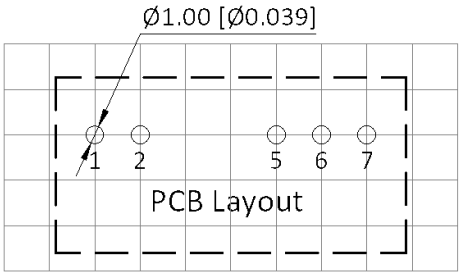
Item	C1, C2	L1	L2
C_{IN}	4.7uF, 50V	12uH	47uH

*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: ±0.50 [±0.020]
* Pin thickness: ±0.10 [±0.004]
* Footprint grid 2.54 x 2.54 mm