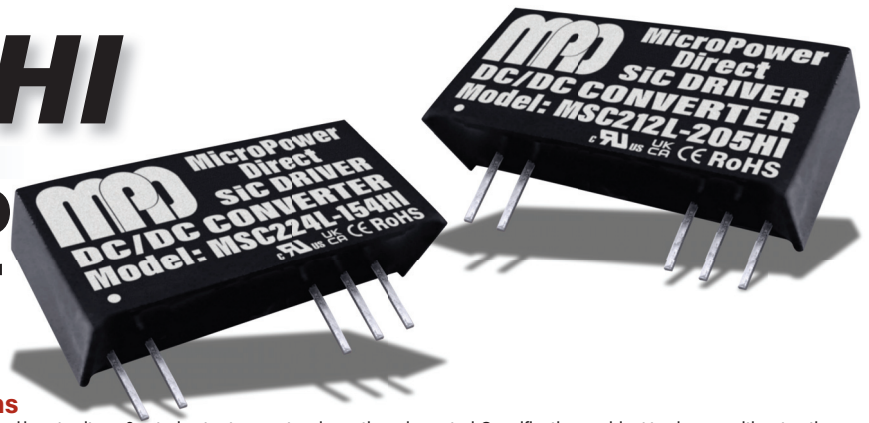


MSC200LHI

“Wide Gap”, 5 kV ISO SiC MOSFET Driver DC/DC Converter



Key Features:

- ≥ 14.14 mm Safety Distance
- EN 62368 Approved (UL)
- 5,000 VAC I/O Isolation
- 87% Efficiency
- -40°C to 105°C Operation
- 2,200 μF Max Cap Load
- Reinforced Insulation
- >3.5 MHour MTBF
- Ultra Low ISO Capacitance
- 12, 15 or 24 VDC Input
- Tight Regulation
- Industry Standard Pin-Out

Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Input

Parameter	Conditions	Min.	Typ.	Max.	Units
Supply Voltage Range		See Model Selection Guide			
Input Filter		Internal Capacitor			

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy		See Tolerance Graphs On Pages 3 & 4			
Line Regulation, See Note 1	+ VOUT		±1.1	±1.5	%
	- VOUT		±1.1	±1.5	
Load Regulation, See Note 2	+ VOUT		8.0	15	%
	- VOUT		8.0	15	
Output Ripple & Noise (20 MHz)	See Note 3		50	100	mV P - P
Temperature Coefficient	Full Load		±0.04	±0.10	%/°C
Output Short Circuit		Continuous (Autorecovery)			

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds, See Note 4	5,000			VAC
Continuous Barrier Withstand Voltage	Input-Output (Per 61800-5-1)	1,700			V
Electrical Clearance		14.14	14.74		mm
Creepage Distance		14.14	14.74		mm
Insulation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz/0.1V		3.5	5.0	pF
CMTI	Input-Output	±200			kV/μS
Switching Frequency			200		kHz

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+105	°C
Storage Temperature Range		-55		+125	°C
Cooling		Free Air Convection			
Pin Soldering Resistance Temperature	See Note 5			300	°C
Case Temperature Rise	Nominal Input, Full Load, Ta = 25°C			40	°C
Humidity	RH, Non-condensing			95	%

Physical

Case Size and Weight	See Mechanical Diagram (Page 5)
Case Material	Non-Conductive Black Plastic (UL94-V0)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	3.5			MHours
Safety Standards	UL/cUL 62368-1 recognition (UL certificate)				
Safety Class	Class III				

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Max Supply Voltage (1 Sec)	V _{IN} = 12 VDC			18.0	VDC
	V _{IN} = 15 VDC			21.0	
	V _{IN} = 24 VDC			30.0	

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.



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Model Selection Guide

Model Number	Input (Supply)				Output 1		Output 2		Efficiency (%)	Max. Capacitive Load (μ F)
	Voltage (VDC)		Current (mA)		Voltage	Current	Voltage	Current (mA)		
	Nom.	Range	Full Load	No Load	Nom. (VDC)	mA	Nom. (VDC)	Max		
MSC212L-154HI	12.0	10.80 - 13.20	215	8.0	15.0	+120.0	-4.0	-120.0	82/87	2,200
MSC212L-205HI	12.0	10.80 - 13.20	213	14	20.0	+90.0	-5.0	-90.0	82/87	470
MSC215L-154HI	15.0	13.50 - 16.50	171	8.0	15.0	+120.0	-4.0	-120.0	77/82	2,200
MSC215L-205HI	15.0	13.50 - 16.50	167	8.0	20.0	+90.0	-5.0	-90.0	82/87	2,200
MSC224L-154HI	24.0	21.60 - 26.40	131	10	15.0	+120.0	-4.0	-120.0	82/87	2,200
MSC224L-205HI	24.0	21.60 - 26.40	129	11	20.0	+90.0	-5.0	-90.0	77/82	2,200

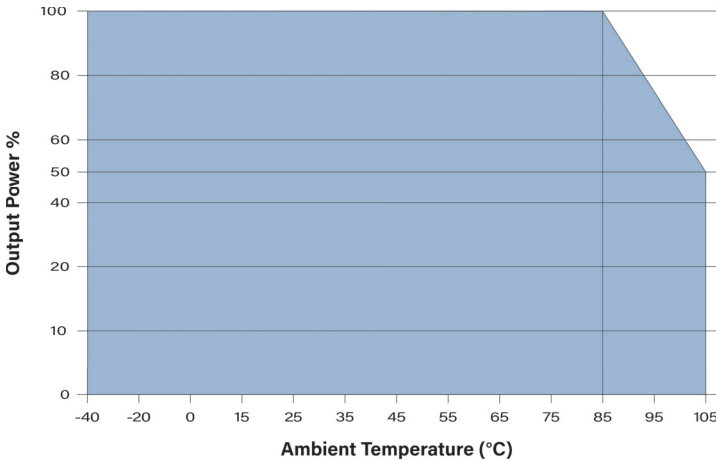
Output Voltage: Min/Max

Model Number	Output 1			Output 2		
	Voltage (VDC)			Voltage (VDC)		
	Min	Typ	Max	Min	Typ	Max
MSC212L-154HI	14.25	15.00	15.75	-3.60	-3.80	-4.00
MSC212L-205HI	18.60	19.60	20.60	-4.95	-5.20	-5.45
MSC215L-154HI	13.80	14.55	15.30	-3.80	-4.00	-4.20
MSC215L-205HI	18.40	19.40	20.40	-4.85	-5.10	-5.35
MSC224L-154HI	14.55	15.30	16.05	-3.96	-4.16	-4.36
MSC224L-205HI	19.00	20.00	21.00	-4.75	-5.00	-5.25

Notes:

- Line regulation is measured for an input voltage change of $\pm 10\%$.
- Load regulation is measured from 10% load to full load.
- When measuring output ripple & noise, it is recommended that an external capacitor (1μ F to 10μ F) be placed from each output to common.
- I/O Isolation is specified with a leakage current of 1 mA max.
- Soldering spot is 1.5 mm from case for 10 seconds.
- The unit will meet radiated and conducted EMI specifications (See EMI Characteristics below) with the addition of external components as shown in the EMI connection diagram on page 5.
- Operation at no-load will not damage these units. However, they may not meet all specifications.

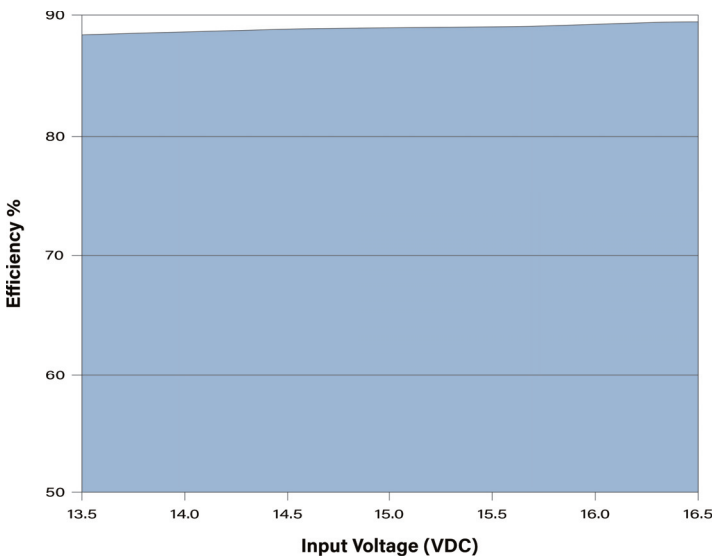
Derating Curve



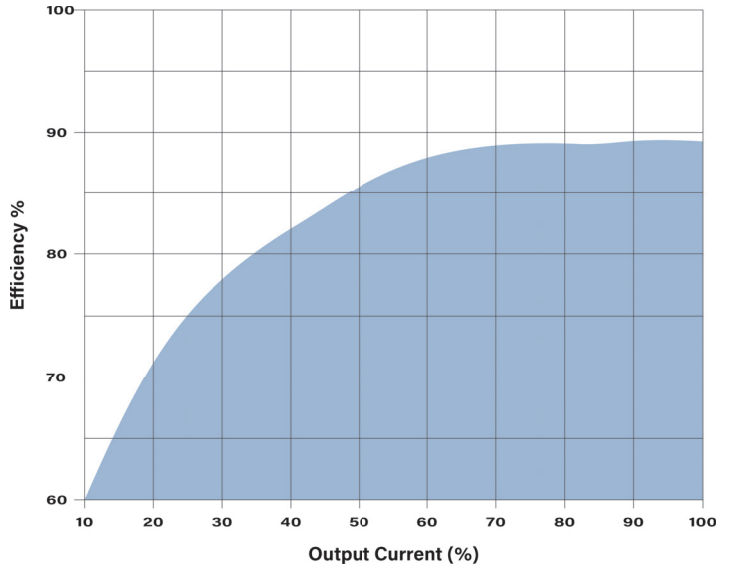
EMI Characteristics:

Parameter	Standard	Criteria	Level
Conducted Emissions	CISPR32/EN 55032		Class A
Radiated Emissions	CISPR32/EN 55032		Class A
ESD	EN 61000-4-2	B	± 8 kV Contact

Efficiency vs Input Voltage: MSC215L



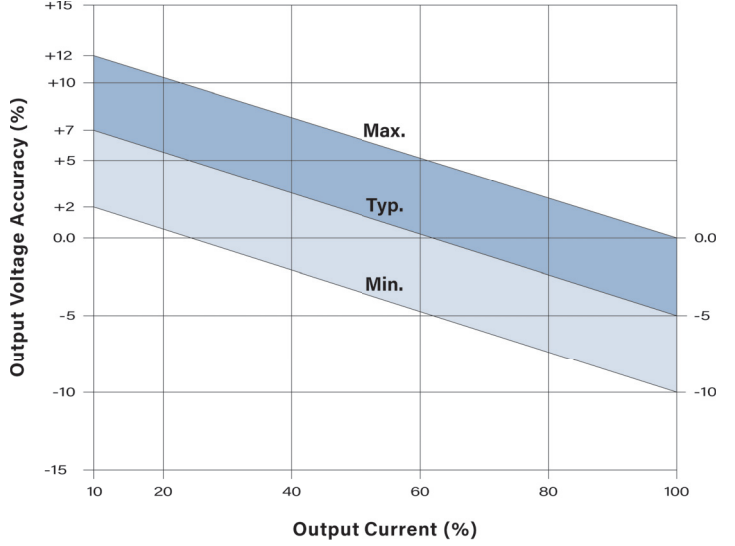
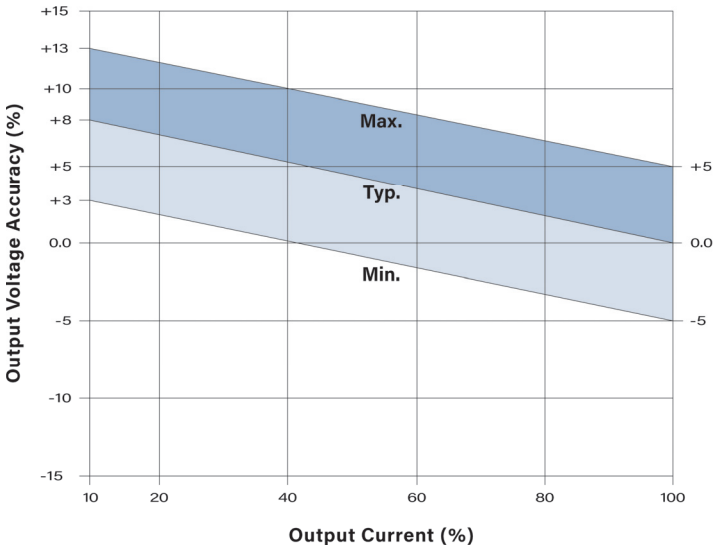
Efficiency vs Output Load: MSC215L



Output Voltage Regulation Curves

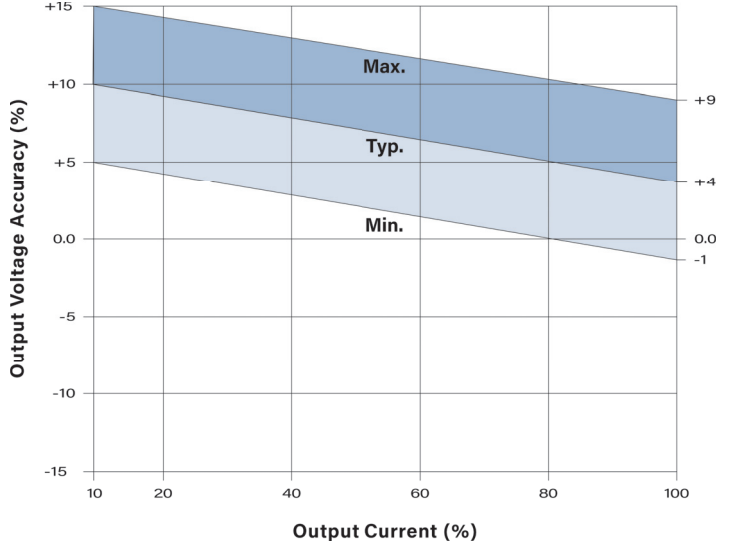
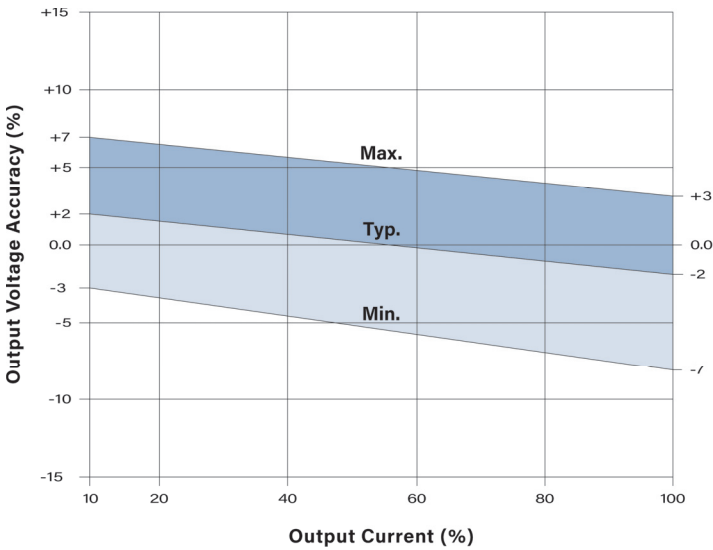
MSC212L-154HI: +15V Output

MSC212L-154HI: -4V Output



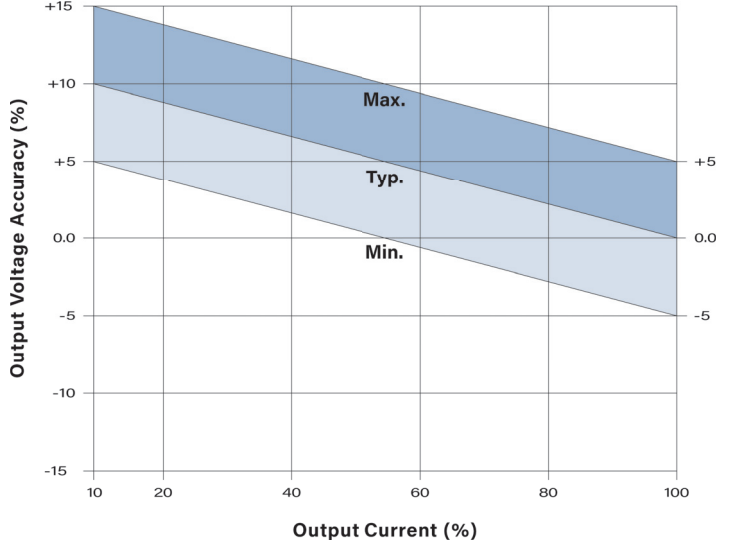
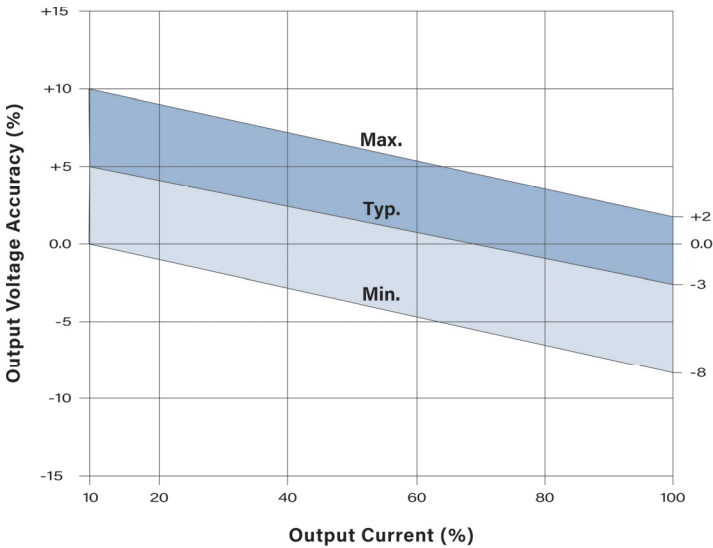
MSC212L-205HI: +20V Output

MSC212L-205HI: -5V Output



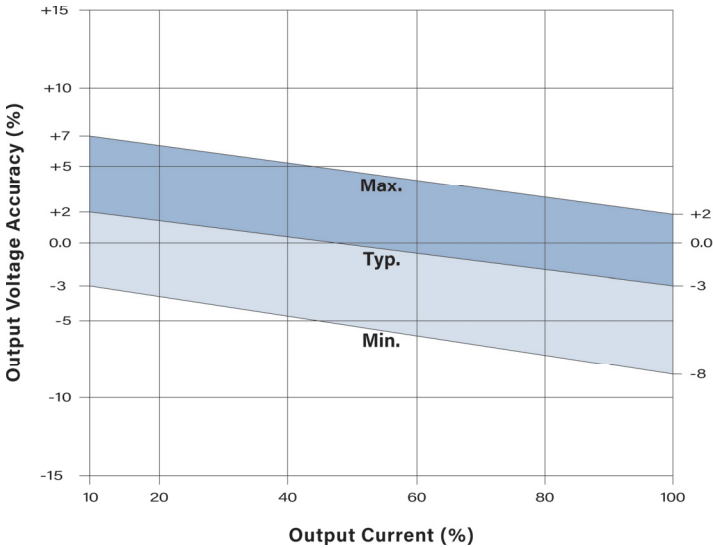
MSC215L-154HI: +15V Output

MSC215L-154HI: -4V Output

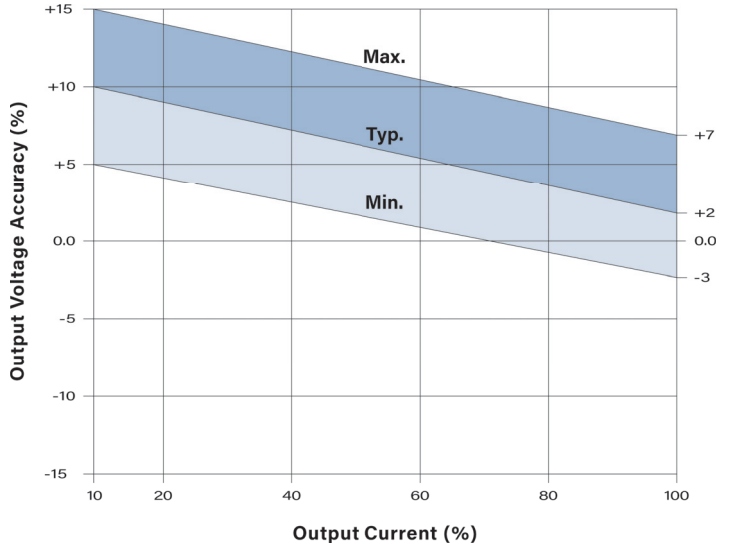


Output Voltage Regulation Curves Cont.

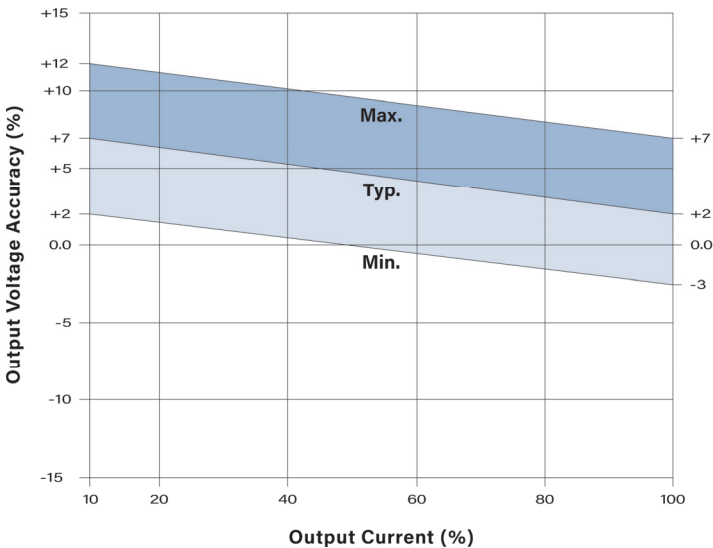
MSC215L-205HI: +20V Output



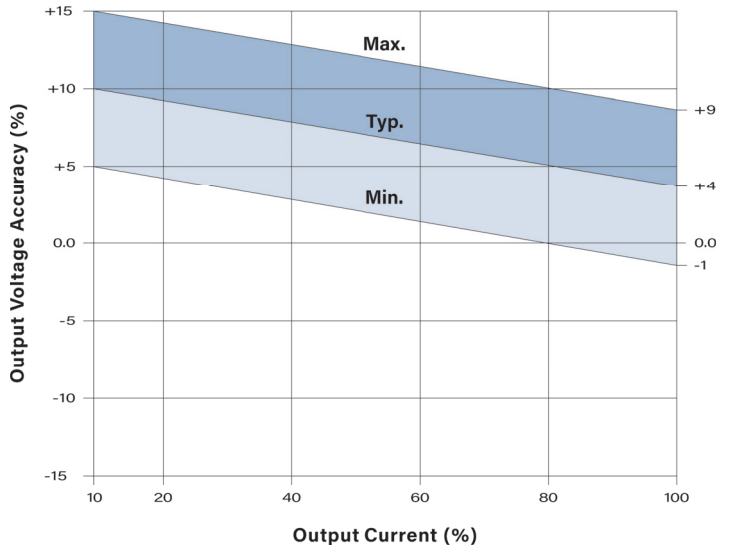
MSC215L-205HI: -5V Output



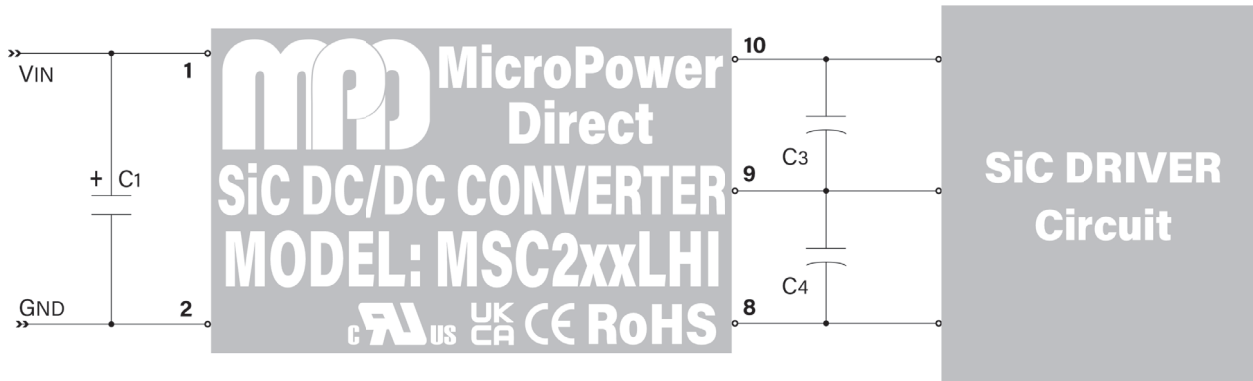
MSC224L-154HI: +15V Output



MSC224L-154HI: -4V Output



Typical Connection



The MSC200LHI is designed to be used in the driver circuits for silicon carbide (SiC) MOSFETs. The asymmetrical outputs of the unit provides the positive/negative gate bias needed to efficiently switch the MOSFET. The circuit above shows a simple connection to a driver circuit. Low ESR electrolytic capacitors should be used. The recom-

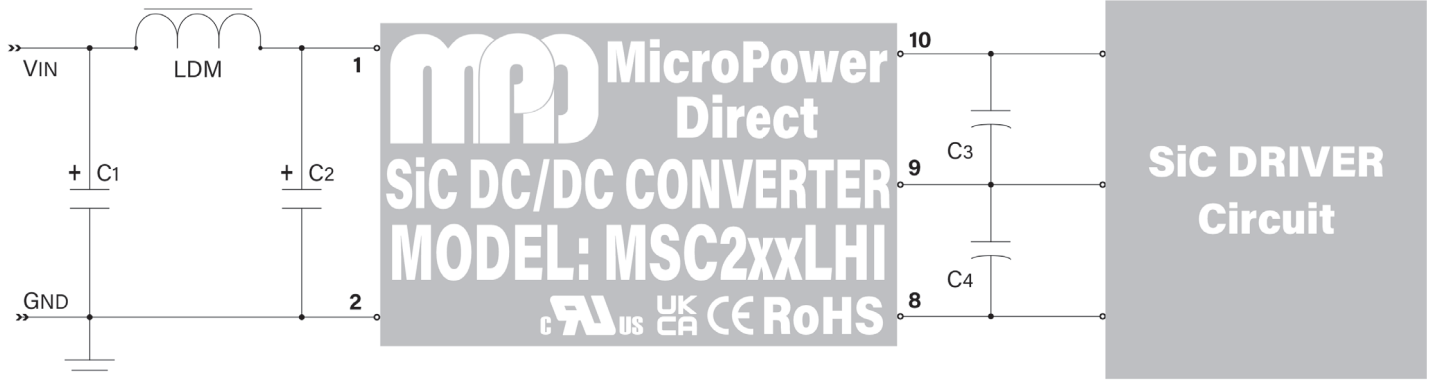
mended values for all capacitors is given in the chart at right.

A connection for circuits that require meeting EMC standards is illustrated on page 5.

Recommended component values:

Component	Value
C1	100 μ F/35V
C3, C4	100 μ F/35V

EMI Connection



The **MSC200LHI** series is designed for use in gate driver circuits. With asymmetrical outputs of +20/-5 VDC or +15/-4 VDC, an isolation barrier specified at 5 kVAC, very low isolation capacitance and a wide operating temperature range; they are an ideal choice for Silicon Carbide (SiC) MOSFET drive & control circuits.

The **MSC200LHI** has the added advantage of a very wide creepage/clearance distance of 14.74 mm. The unit will typically maintain its high input/output insulation level even if the product is damaged.

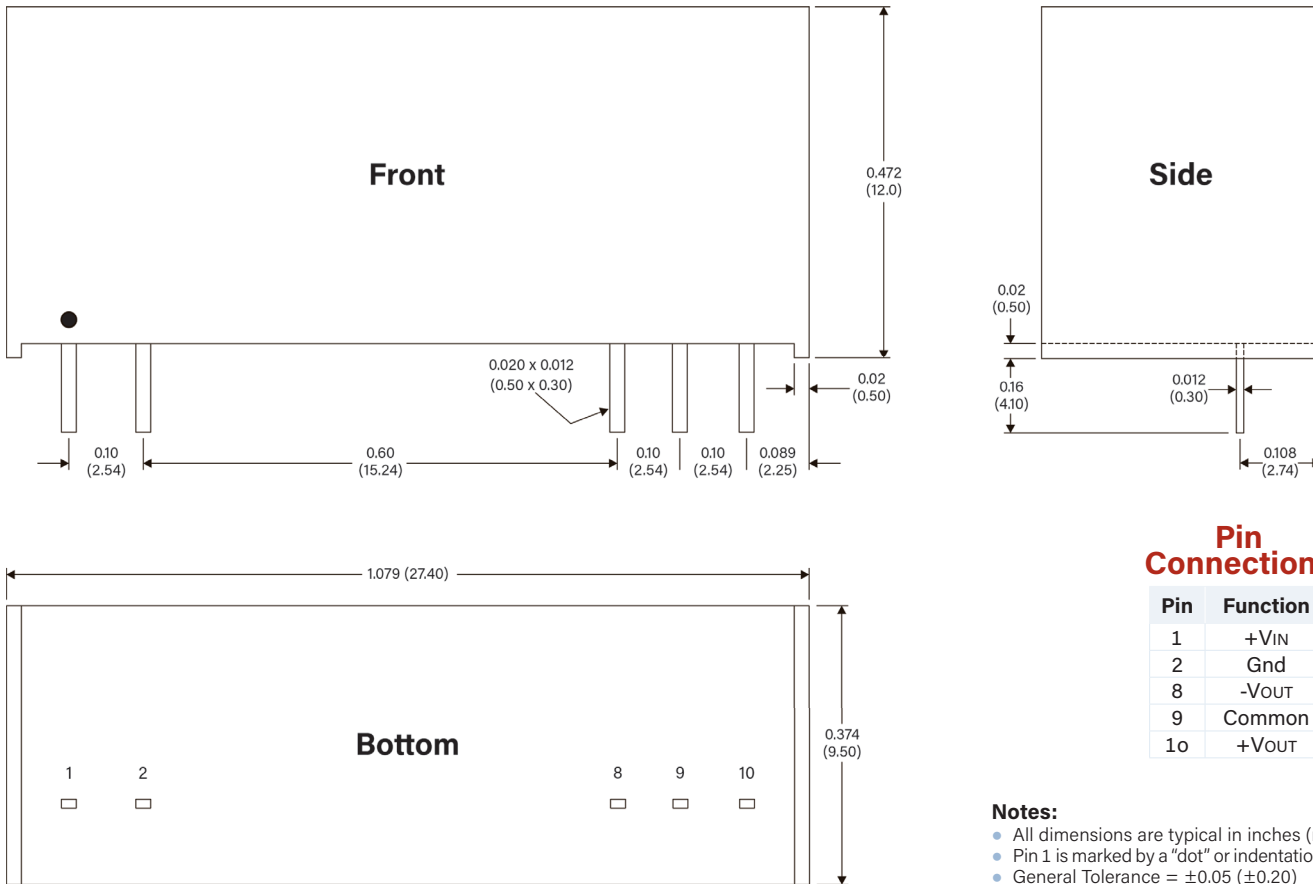
The diagram above illustrates a typical connection of the **MSC200LHI** series for an application that requires compliance to EMI/EMC standards EN 55032 and EN 61000-4.

For many applications simply adding input/output capacitors will enhance the input will be sufficient. To meet EMC standards, the simple input Pi filter shown above is recommended. All input capacitors used should be low ESR components. The value of all components is given at right.

Recommended component values:

Component	Value
LDM	33 μ H
C1, C2	1.0 μ F/ 35V
C3, C4	100 μ F/35V

Mechanical Dimensions



Pin Connections

Pin	Function
1	+VIN
2	Gnd
8	-Vout
9	Common
1o	+Vout

Notes:

- All dimensions are typical in inches (mm)
- Pin 1 is marked by a "dot" or indentation on the unit
- General Tolerance = ± 0.05 (± 0.20)
- Pin Tolerance = ± 0.004 (± 0.10)
- Recommended pin hole size (on the application PC Board) is $\varnothing 0.039$ ($\varnothing 1.00$)
- Weight (Typ) = 0.231 Oz (5.3g)



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