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MA3AE12_EVAL – Isolating Amplifier for current measurement with MIPAQ™ Base

IFAG IPC APS

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- SP number updated

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1. Introduction

The MA3AE12_EVAL current measurement board as shown in Figure 1 was developed to support user during their first steps designing applications with the MIPAQ™ base modules.

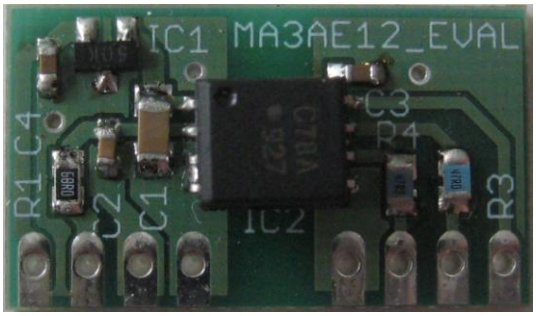
The MA3AE12 current measurement evaluation boards are available from Infineon in small quantities. Functions and properties of these parts are described in the datasheet chapter of this document whereas the remaining paragraphs provide information intended to enable the customer to copy, modify and qualify the design for production.

The design of the MA3AE12 was performed with respect to the environmental conditions described as design target in this document. The requirements for lead free reflow soldering have been considered when components were selected. The design was tested as described in this documentation but not qualified regarding manufacturing and operation in the whole ambient temperature operating range or lifetime.

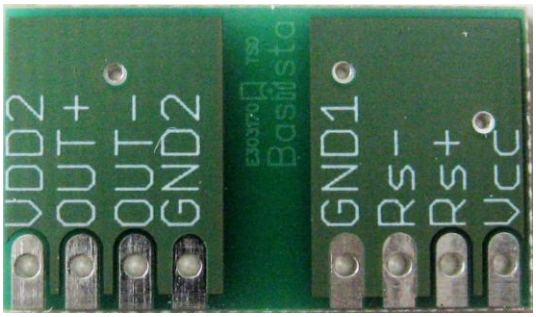
The boards provided by Infineon are subjected to functional testing only.

Due to their purpose, the evaluation boards are not subjected to the same procedures regarding Returned Material Analysis (RMA), Process Change Notification (PCN) and Product Discontinuation (PD) as regular products.

See legal disclaimer and warnings for further restrictions on Infineon's warranty and liability.



a) Top side



b) bottom side

Figure 1 The Module Power supply board

1.1 Part number explanation

The notation of this evaluation has to be interpreted as explained in the following Table

MA3AE12_EVAL	MA	Module Adapter board
	3A	measured current up to 300A
	E12	Maximum blocking voltage of IGBT Module 1200V
	EVAL	Evaluation Board

Table 1 Explanation of the part number

1.2 Key data

All values given in the Table bellow are values at ambient temperature T_A = 25 °C.

Parameter	min	Typ	Max	Unit
Input side Supply voltage V_{CC}	7		25	V
Output side supply voltage V_{DD2}	4,5	5	5,5	V
Input side supply current I_P	9		16	mA
Output side supply current I_S	13		16	mA
Input voltage range (linear)	-200		+200	mV

Table 2 General key data and characteristic values

2 Design features

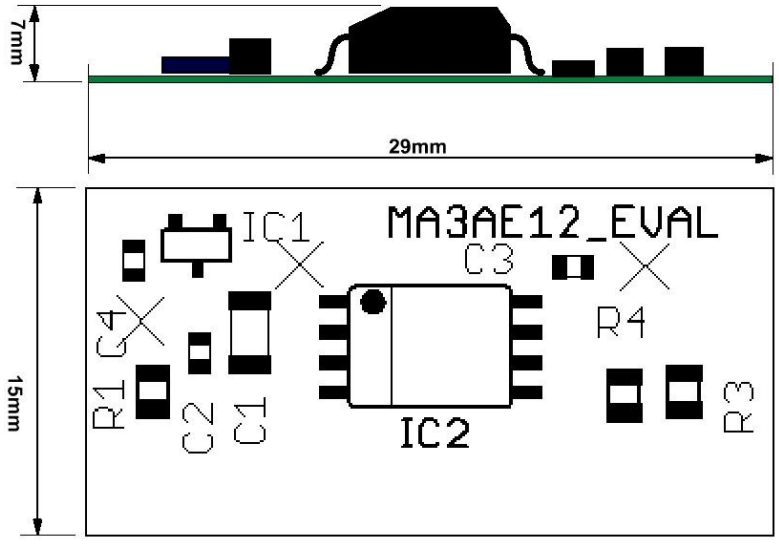
Electrical features of the evaluation board and mechanical dimensions including necessary interface connections are presented in following sections.

2.1 Main features

The MA3AE12_EVAL offers the following features:

- 15 kV/µs Common-Mode Rejection at V_{CM} = 1000 V
- A fully differential amplifier ACPL-C78A
- PCB is designed to fulfill the requirements of IEC61800-5-1, pollution degree 2, overvoltage category III

2.2 Dimension of the Board



2.3 Functionality

The MA3AE12 board offers a reliable and cost efficient solution to sense each output phase current of the MIPAQ™ base in Figure 2. MA3AE12 requires to be powered by two different sources. The primary side of MA3AE12 can be powered by respectively floating top igbt gate driver voltage supply. The second side of MA3AE12 can be powered by one external source. This could be the same supply that is used for the external control unit.
The voltage from the current sensing resistor[1] is applied to the input Rs+ and Rs- through an RC anti-aliasing filter (R1 and C2). The differential output voltage OUT+ and OUT- is proportional to the main IGBT phase current and can be externally converted to a single-ended signal by using an operational amplifier.

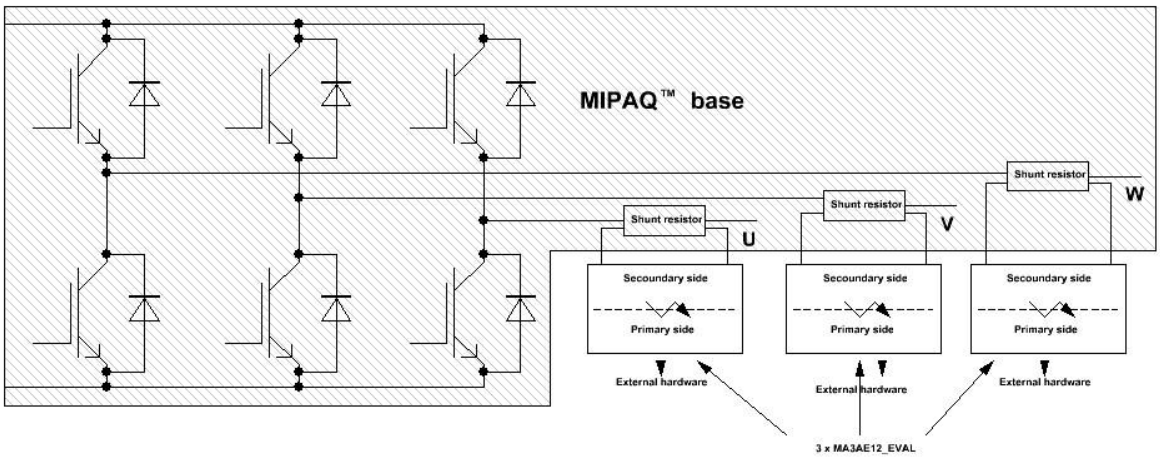


Figure 2 Current measurement on MIPAQ™ base with MA3AE12_EVAL

2.4 Linearity

The transfer linearity of the chosen differential Amplifier ACPL-C78A as described in the datasheet[2], is ensured up to the nominal current of all available MIPAQ™ base modules.

MIPAQ™ base	Shunt resistor value [mΩ]	Shunt voltage @ I_{nom} [mV]
IFS75B12N3T4_B31	2,4	180
IFS100B12N3T4_B31	1,5	150
IFS150B12N3T4_B31	1	150

Table 3 Shunt voltage according to the MIPAQ™ base module

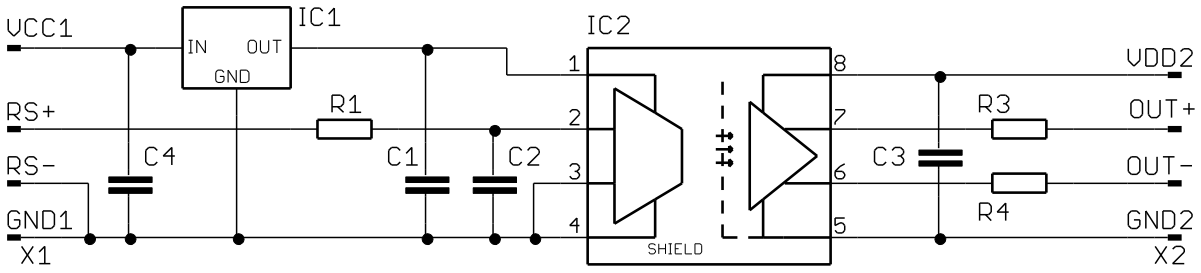
Note: the series ACPL-C79X is available for higher accuracy.

[1] Shunt resistor internal to MIPAQ™ base
[2] Further information is available in the datasheet

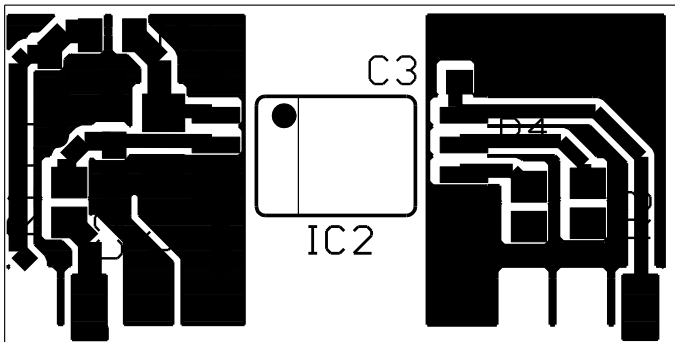
3 Schematic and Layout of MA3AE12_EVAL

To meet the individual customer requirements and to make the evaluation board a simple starting point for further developments or modifications, all necessary technical data like schematic, layout and components are included in this chapter.

3.1 Schematics



3.2 Layout



3.3 Bill of Material - MA3AE12_EVAL

The tolerances for resistors should be less or equal ±1 %, for capacitors of the type C0G less or equal ±5 % and for capacitors of the type X7R less or equal ±10 %.

Type	Value / Type	Package	QTY	Name Part	Recommended Manufacturer
Capacitor	100n/25V/X7R	0603	3	C3, C4	-
Capacitor	100n/25V/X7R	1206	3	C1	-
Capacitor	10n/25V/X7R	0603	1	C2	-
Semiconductor	ZMR500FTA	SOT23	1	IC1	Zetex
Semiconductor	ACPL-C78A	SSO-8	1	IC2	Avago
Resistor	68R	0805	1	R1	-
Resistor	47R	0805	2	R3, R4	-

Table 4 Bill of Material for MA3AE12_EVAL

4 How to order Evaluation Boards

Every Evaluation Board has its own IFX order number and can be ordered via your Infineon Sales Partner.

Information can also be found at the Infineon's Web Page: www.infineon.com

CAD-data for the board described here are available on request. The use of this data is subjected to the disclaimer given in this AN. Please contact: WAR-IGBT-Application@infineon.com

IFX order number for MA3AE12_EVAL: SP000855486

5 References

Datasheet of ACPL-C78A

Datasheet of IFS75B12N3T4_B31

Datasheet of IFS100B12N3T4_B31

Datasheet of IFS150B12N3T4_B31

Application Note AN2009-05 "Making use of Modules with integrated Shunts"