

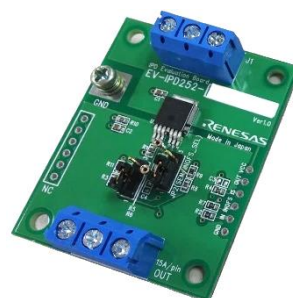
# Intelligent Power Device

## IPD Evaluation Board EV-IPD252 User Guide

### Introduction

This user guide describes the configuration and usage of the EV-IPD252 evaluation board for IPD products in TO-252 package.

The EV-IPD252 board is designed for quick evaluation of Renesas IPDs and is not intended to evaluate or guarantee all the characteristics of the IPD products it is equipped with.



### Target Device

Renesas Electronics IPD High Current Operation series

uPD166033T1U, uPD166034T1U, uPD166031AT1U, uPD166032T1U, RAJ2810024H12HPD

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## 1. EV-IPD252 Evaluation Board overview

EV-IPD252 is a board for quick evaluation of Renesas' IPD products in TO-252 package. The boards are equipped with the necessary connectors and jumpers for evaluation, allowing customers to start evaluation early, before developing their own boards for target products. The IPD products mounted on this evaluation board are working samples and its quality is not guaranteed.

### 1.1 Board Name

The board name is marked on the board to identify the device it is equipped with.

EV-IPD252-□□□-□□□□

Serial Number

Mounted IPD device

033: uPD166033T1U (6mohm [typ.])

034: uPD166034T1U (8mohm [typ.])

031A: uPD166031AT1U (10mohm [typ.])

032: uPD166032T1U (12mohm [typ.])

T024: RAJ2810024H12HPD (2.0mohm [typ.], Under development)

Board Name

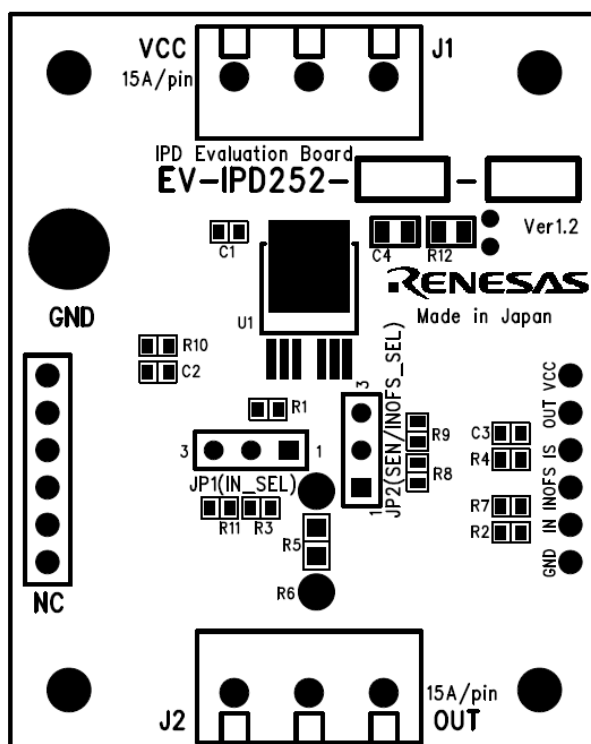


Figure 1. Layout of EV-IPD252 board

## 2. PCB specification

EV-IPD252 uses an automotive grade PCB. The board size and number of layers are as below.

Parameter	Value
Board size	50.0 mm x 40.0 mm
Thickness of Cu layer	35 $\mu$ m
Cu layer numbers	2
Board material	FR4

**Table 1. PCB specification**

## 3. Connections

EV-IPD252 is equipped with a connector and test pins to evaluate the on-board IPD. Please refer to the following table for the description of each and precautions for use.

Connector	Pin count	Function
J1*1	1-3	J1 is the VCC power supply pin; one pin can handle a 15A current, so connect the appropriate number of wires according to the evaluation conditions. It is designed to handle currents up to 45A with maximum three wires connections.
J2*1	1-3	J2 is the OUTPUT pin; one pin can handle a 15A current, so connect the appropriate number of wires according to the evaluation conditions. It is designed to handle currents up to 45A with maximum three wires connections.
TP-GND	1	This pin is used to monitor GND.
TP-IN	1	This pin is used to control the IN pin that controls the state of the mounted IPD from an external MCU board or power supply.
TP-INOFS/SEN	1	This test pin is connected to the 6th pin of the mounted IPD. This test pin is connected to the SEN pin in the uPD1660xx family and to the INOFS pin in the RAJ2810024.
TP-IS	1	This test pin is connected to the IS pin of IPD. It allows to know the sense current and protection/diagnostic results.
TP-OUT	1	This pin is used for monitoring the OUT signal. This test pin is for checking, so do not connect any load to this pin.
TP-VCC	1	This pin is for monitoring VCC. Please do not use this test pin as a power supply input for VCC.
JX	1-7	Test pin, Not connected
GND pad	1	GND is connected by a wire, winding it up and tightening it with an M3 bolt and nut.

Note1: The jumpers on the board should be operated when the power to the EV-IPD252 board is turned off.

**Table 2. PCB specification**

#### 4. Jumper pin setting for each IPD

The pin assignment differs depending on the mounted IPD. EV-IPD252 is designed to allow evaluation of different pin out product with jumper settings.

JP	Setting	Mounted IPD	Description
JP1	1-2	All	By connecting an external power supply or MCU board to TO-IN, it is possible to control ON/OFF of the on-board IPD from outside.
	2-3		Jumper setting to set the IN pin to high level from the power supplied to VCC. This setting is used when this board is used by itself without external control signals.
	Open		By setting JP1 to the open state, IPD stops outputting. This setting is used when this board is used by itself without external control signals.
JP2	1-2	uPD1660xxT1U	By connecting an external power supply or MCU board to TO-INOFS/SEN, it is possible to provide high level to on-board IPD's SEN pin (6 <sup>th</sup> pin).
		RAJ2810024H12HPD	By connecting an external power supply or MCU board to TO-INOFS/SEN, it is possible to provide high level to on-board IPD's INOFS pin (6 <sup>th</sup> pin).
	2-3	uPD1660xxT1U	Jumper setting to set the SEN pin to high level from the power supplied to VCC. This setting is used when this board is used by itself without external control signals.
		RAJ2810024H12HPD	Jumper setting to set the INOFS pin to high level from the power supplied to VCC. This setting is used when this board is used by itself without external control signals.
	Open	uPD1660xxT1U	By opening the JP2, SEN input becomes low level due to the built-in resistance of the IPD.
		RAJ2810024H12HPD	By opening the JP2, INOFS input becomes low level due to the built-in resistance of the IPD.

**Table 3. Jumper setting**

## 5. Schematics

The EV-IPD252 board schematic is shown below; the N.C. test pins are not described in the schematic.

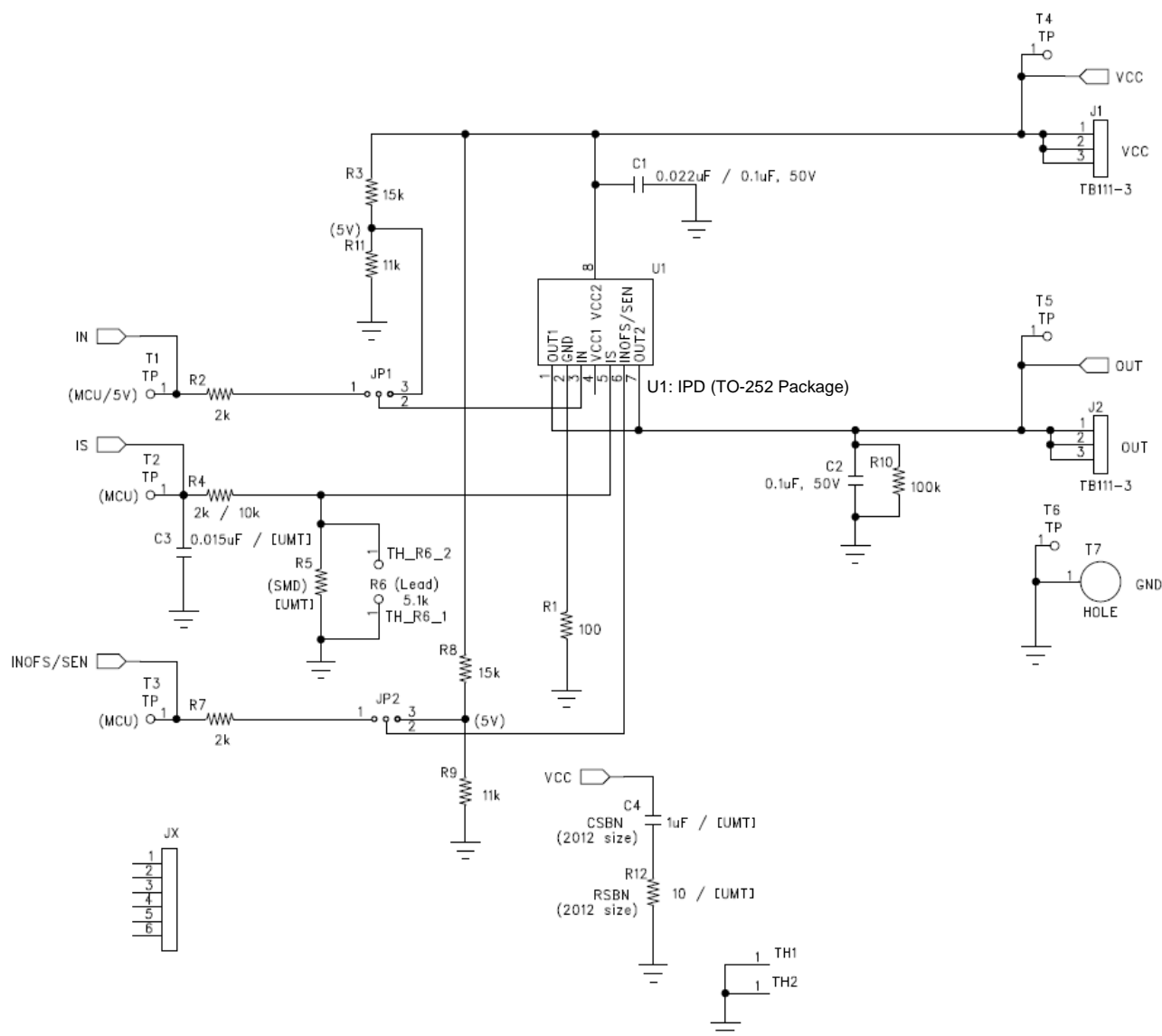


Figure 2. EV-IPD252 schematics

## 6. Parts list

The following is a list of the components mounted on the EV-IPD252. Some of the mounted components have lower heat resistance than the operating temperature range of IPD. If evaluated in high temperature, remove the parts as necessary.

Symbol	Parts name	Part number	Vendor	Note
U1	Target IPD	uPD166033T1U, uPD166034T1U, uPD166031AT1U, uPD166032T1U, RAJ2810024H12HPD	Renesas	
C1	Multilayer ceramic capacitor	C1608X8R1H223K08AA	Murata	
C2	Multilayer ceramic capacitor	GCM188L81H104KA57D	Murata	
C3	Multilayer ceramic capacitor	VJ0603Y153KXAAC	Vishay Intertechnology, Inc.	
C4	Multilayer ceramic capacitor	GCM188L81H104KA57D  Only for RAJ2810024H12HPD	Murata	
JP1	Jumper	XJ8D-0311	OMRON	<105°C
JP2	Jumper	XJ8D-0311	OMRON	<105°C
J1	Terminal block	TB111-2-3-U-1-1	Alphaplus	<115°C
J2	Terminal block	TB111-2-3-U-1-1	Alphaplus	<115°C
R1	SMT chip resistor	RMC1/16-101J TP	Kamaya elec.	
R2	SMT chip resistor	RMC1/16-202J TP	Kamaya elec.	
R3	SMT chip resistor	RMC1/16K153F TP	Kamaya elec.	
R4	SMT chip resistor	RMC1/16-202J TP	Kamaya elec.	
R5	SMT chip resistor	Not mount		
R6(socket)		RI-1S/O-SG/7.43  5.1K ohm resistor is mounted on this socket	Useconn	
R7	SMT chip resistor	RMC1/16-202J TP	Kamaya elec.	
R8	SMT chip resistor	RMC1/16K153F TP	Kamaya elec.	
R9	SMT chip resistor	RMC1/16-113J TP	Kamaya elec.	
R10	SMT chip resistor	RMC1/16-104J TP	Kamaya elec.	
R11	SMT chip resistor	RMC1/16-113J TP	Kamaya elec.	
R12	SMT chip resistor	SG73P2ATTD100J	KOA	
JX	Test pin	Not mount		

**Table 4. IPD Evaluation Board EV-IPD252 parts list**

## 7. Snubber circuit for RAJ2810024H12HPD

A snubber circuit is added in the EV-IPD252 Ver1.2 board to prevent the VCC voltage drop below the minimum operating voltage of the IPD due to resonance between the parasitic inductance ( $L_p$ ) and parasitic resistance ( $R_p$ ) of the connected loads and harnesses.

Please refer to the RAJ2810024H12HPD datasheet for details on this snubber circuit.

The snubber circuit is unmounted when IPD products other than RAJ2810024H12HPD are mounted.

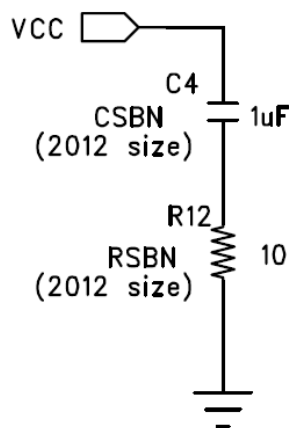


Figure 3. Snubber circuit for RAJ2810024H12HPD

## 8. Reference document

For the specifications of the IPDs supported by the EV-IPD252 board, please refer to the following datasheet.

Part number	Datasheet document number
uPD166033T1U	R07DS1167JJ0200
uPD166034T1U	R07DS1168JJ0200
uPD166031AT1U	R07DS1308JJ0100
uPD166032T1U	R07DS1166JJ0200
RAJ2810024H12HPD	R07DS1540EJ0100

Table 5. IPD datasheets

**Revision History**

Rev.	Date	Description	
		Page	Summary
1.00	Apr. 15, 2024	-	First issue



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## Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

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