R2A30440NP

R19DS0063EJ0100
Rev.1.00
May 10, 2012

6-Channel Motor Driver IC for DSC, DVC and Surveillance Cameras

Overview

The R2A30440NP is a semiconductor integrated circuit that incorporates driver circuits suitable for motors in digital cameras.
The terminal arrangements are basically identical to that of R2A30423NP.

Features

- CMOS process adoption and 1ch-4ch using D class amplifier to achieve low power consumption.
- A small 40-pin QFN package 5mm x 5mm, t=0.80mm (max) is used.
- Built-in autonomous drive circuit controlled by serial settings (self propelled control)
- 1ch/2ch and 3ch/4ch are capable of 2-2 phase stepper drive, 1-2 phase (100%) stepper drive, 1-2 phase (70%) stepper drive and 256/512/1024 resolution micro-steps.
- 3ch/4ch is capable of constant voltage drive.
- 5ch is capable of constant current drive and FLL control.
- 6ch is capable of constant current drive.
- By using exclusive control mode on 5ch and 6ch, it resembles 7ch drive.
- Built-in 3 PI drivers channels
- Built-in 2 comparators and 1 Schmitt buffer.
- Built-in low-voltage malfunction prevention and thermal shutdown circuit.
- Power supplies VCC and VM are internally isolated and include a function to prevent reverse current between the power supplies.

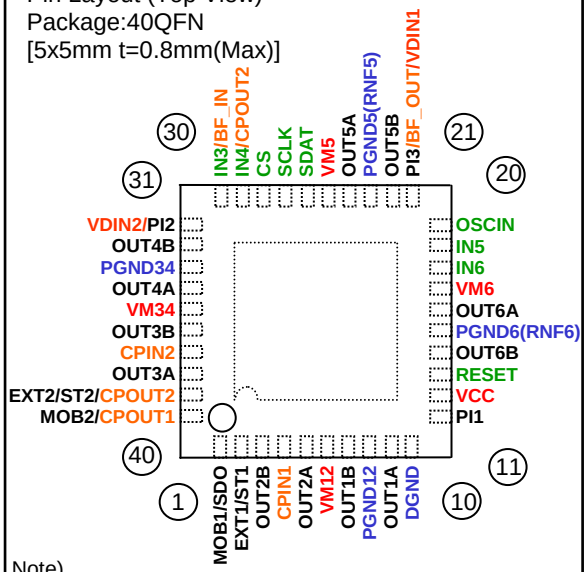
Application

Motor driver for digital still cameras

Recommended operating conditions

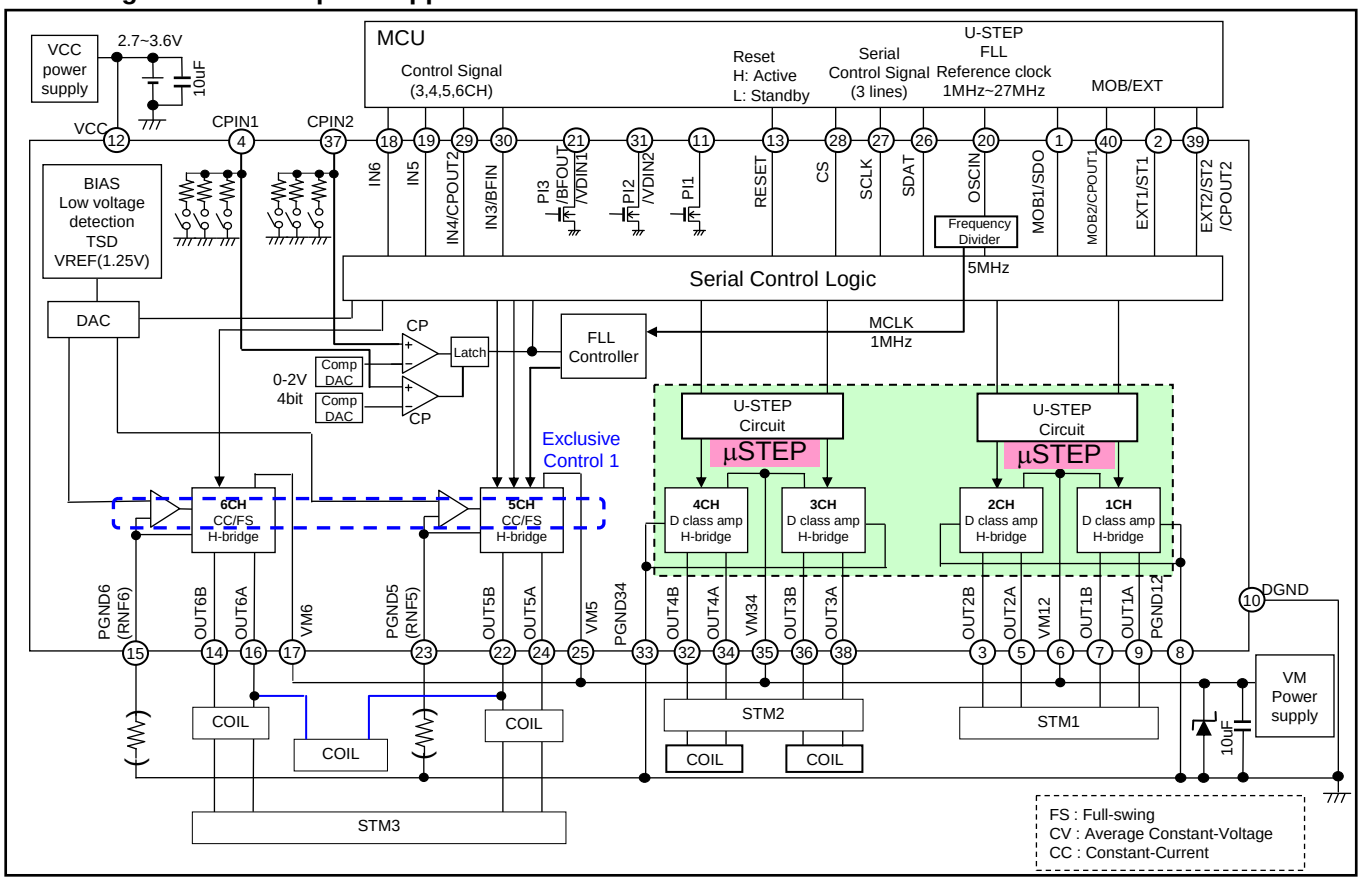
Power-supply voltage range · · · · · · · · · · · · · VCC: 2.7V~3.6V
VM: 2.7V~5.5V
Rated power-supply voltage · · · · · · · · · · · · · VCC: 3.3V
VM: 5.0V

Pin Layout (Top View)
Package:40QFN
[5x5mm t=0.8mm(Max)]



Note)
- The terminals (lead) are on the package underside.
- At the Package central underside is a heat sink PAD. Heat dissipation shield (and etc.) connection at DGND is recommended.
- Each VM pins respectively are not connected to each other internally. Please connect them externally.

Block diagram and example of application circuit

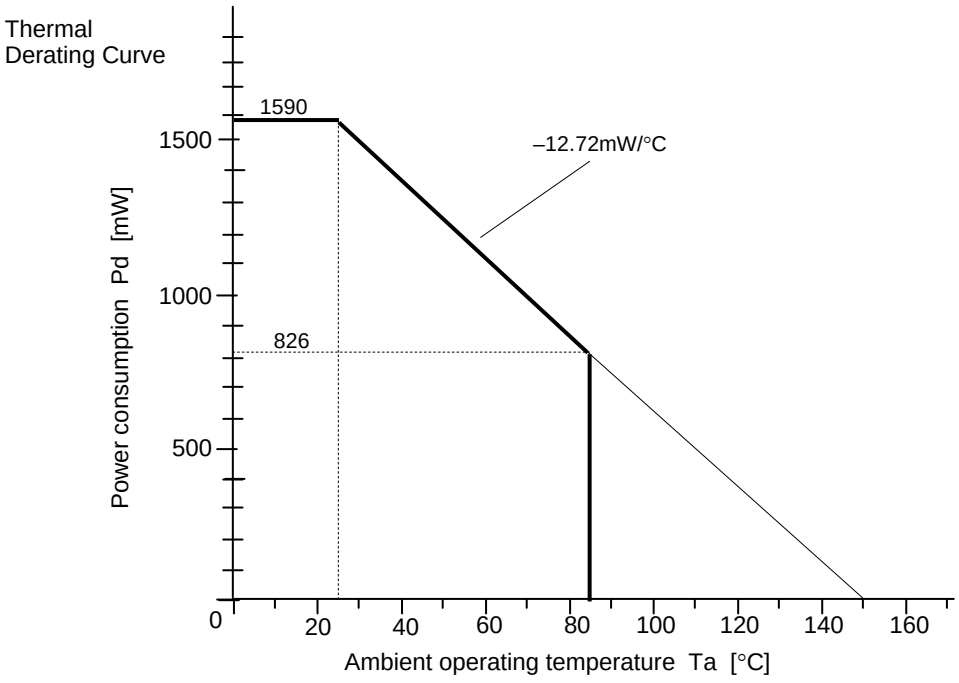


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Absolute Maximum Ratings (Unless specified, the ambient temperature is 25°C)

Item	Symbol	Rated Value	Unit	Remarks
Power-supply voltage 1	VCC	6.5	V	Note1
Power-supply voltage 2	VM	6.5	V	Note1
Direct current (1ch~2ch)	Iod	±600	mA/ch	Note4 DC
Instantaneous output current (1ch~2ch)	Iop	±800	mA/ch	Note4 PW < 10ms, Duty ≤ 20%
Direct current (3ch~6ch)	Iod	±800	mA/ch	Note4 DC
Allowable power consumption	Pd	1590	mW	Note2 (Ta = 25°C)
Thermal derating ratio	Kθ	–12.72	mW/°C	Note2 (Ta ≥ 25°C)
Max. junction temperature	Tj	150	°C	
Applied input voltages	Vin	–0.3~VCC+0.3	V	Note3
Ambient operating temperature	Topr	–30~85	°C	
Storage temperature	Tstg	–40~150	°C	

Notes: 1. As a rule, do not apply reverse power-supply voltages.
2. Glass epoxy board: 76.2mm x 114.5mm x 1.6mm,
copper-occupancy ratio in a 4-layer board: 20% in layers 1 and 4, 100% in layers 2 and 3.
Note that the allowable power consumption changes according to the conditions imposed on the board.
3. As a rule, do not apply voltages above the power-supply voltage or below the GND voltage.
4. The total output current does not exceed the rated value in usage with multiple channels simultaneously turned on.



[Remarks]

The electric power which the power consumption of this IC with the output transistor of 1ch - 6ch becomes dominant.

Output transistor power consumption formula

<Full Swing/Constant Voltage>: (output current)^2 x ON resistance E.g. (500mA)^2 x 2.0ohm=500mW

<Constant current>: output current x {VM – RNF5 – output current x RM}

Note: In constant current control, the on resistance is not included in the calculation

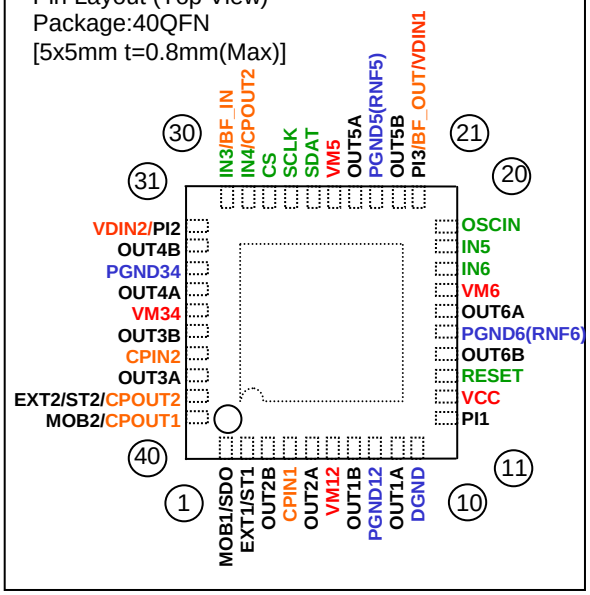
We recommend that you solder to connect the heatsink at the bottom of the package.
(To fix it to a potential, please connect with pin 10: DGND)
When the ambient temperature is 25°C or more, refer to the above figure in selecting the required heat sink.

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Terminal Function Explanation

Pin No.	Pin Name	I/O	Pin Function
1	MOB1/SDO	O	MOB1/SDO output
2	EXT1/ST1	O	EXT1/ST1 output
3	OUT2B	O	Channel 2 B output
4	CPIN1	I	Comparator 1 input
5	OUT2A	O	Channel 2 A output
6	VM12	Power supply	Motor power supply for channels 1, 2
7	OUT1B	O	Channel 1 B output
8	PGND12	GND	Motor power GND for channels 1, 2
9	OUT1A	O	Channel 1 A output
10	DGND	GND	Control GND
11	PI1	O	PI driver output
12	VCC	Power supply	Control power supply
13	RESET	I	Internal logic reset
14	OUT6B	O	Channel 6 B output
15	PGND6(RNF6)	GND	Motor power GND for channel 6
16	OUT6A	O	Channel 6 A output
17	VM6	Power supply	Motor power supply for channel 6
18	IN6	I	Channels 5, 6 control
19	IN4	I/O	Channels 4, 5, 6 control /Comparator 2 output
20	OSCIN	I	Clock
21	PI3/BF_OUT /VDIN1	I/O	PI driver output/Buffer Output /VD signal input 1
22	OUT5B	O	Channel 5 B output
23	PGND5(RNF5)	GND	Motor power GND for channel 5
24	OUT5A	O	Channel 5 A output
25	VM5	Power supply	Motor power supply for channel 5
26	SDAT	I	Serial control signal
27	SCLK	I	Serial control signal
28	CS	I	Serial control signal
29	IN4	I	Channels 3, 4, 5, 6 control
30	IN3/BF_IN	I	Channels 3, 5 control/Buffer input
31	PI2/VDIN2	I/O	PI driver output/ VD signal input 2
32	OUT4B	O	Channel 4 B output
33	PGND34	GND	Motor power GND for channels 3, 4
34	OUT4A	O	Channel 4 A output
35	VM34	Power supply	Motor power supply for channels 3, 4
36	OUT3B	O	Channel 3 B output
37	CPIN2	I	Comparator 2 input
38	OUT3A	O	Channel 3 A output
39	EXT2/ST2 /CPOUT2	O	EXT2/ST2 output /Comparator 2 output
40	MOB2 /CPOUT1	O	MOB2 output /Comparator 1 output

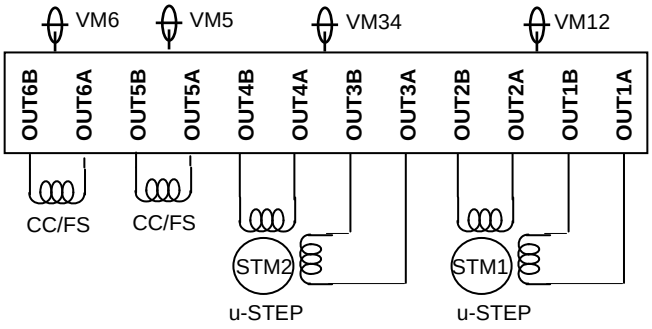
Pin Layout (Top View)
Package:40QFN
[5x5mm t=0.8mm(Max)]



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Actuator connection pattern(1)

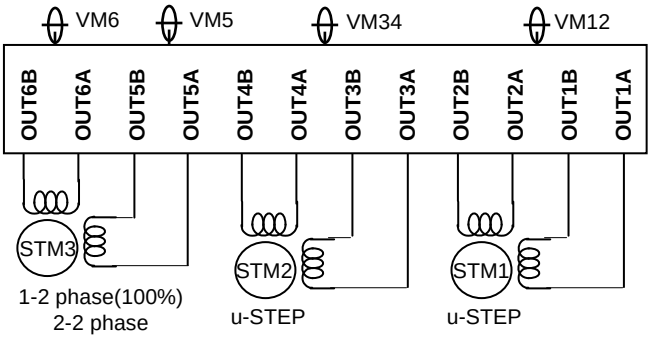
[Connection pattern 1]



1ch	2ch	3ch	4ch	5ch	6ch
STM1		STM2		CC/FS	CC/FS
Serial autonomous control		Serial autonomous control		1line control (IN3 or IN4 or IN5) or 2line control (IN3/IN4) (IN3/IN5) (IN4/IN5) or Serial or serial (automatic PWM) or 1line control (IN3or IN4 or IN5) FLL control serial+1line (IN3 or IN4 or IN5)	1line control (IN6) or 2line control (IN5/IN6)

The control method of each CH is set through serial.
5ch FLL control/ automatic PWM control is only valid after FS mode is selected.

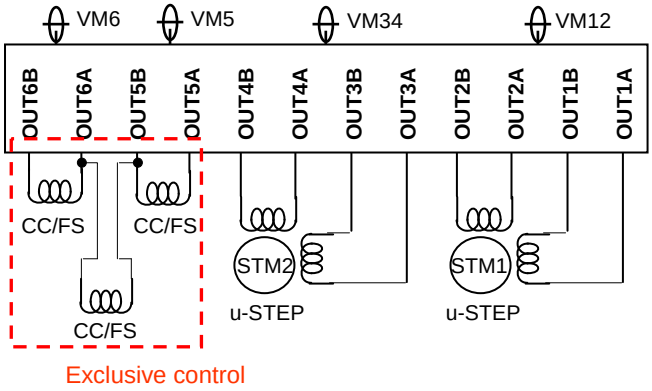
[Connection pattern 2]



1ch	2ch	3ch	4ch	5ch	6ch
STM1		STM2		STM3 CC/FS	
Serial autonomous control		Serial autonomous control		3line control (IN4/IN5/IN6) or (IN3/IN5/IN6)	

The control method of each CH is set through serial.

[Connection pattern 3]



1ch	2ch	3ch	4ch	5ch	6ch	7ch
STM1		STM2		CC/FS	CC/FS	CC/FS
Serial autonomous control		Serial autonomous control		1line control (IN3 or IN4 or IN5) or 2line control (IN3/IN4) (IN3/IN5) (IN4/IN5) or serial or serial (automatic PWM) or 1line control (IN3or IN4 or IN5) FLL control serial+1line (IN3 or IN4 or IN5)	1line control (IN6) or 2line control (IN5/IN6)	Serial

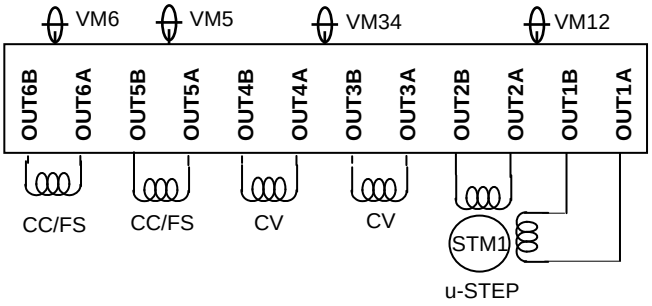
The control method of each CH is set through serial.
5ch FLL control/ automatic PWM control is only valid after FS mode is selected.

Exclusive Control
5ch,6ch,7ch cannot be simultaneously operated.
Only one channel is operated at a time.

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Actuator connection pattern(2)

[Connection pattern 4]

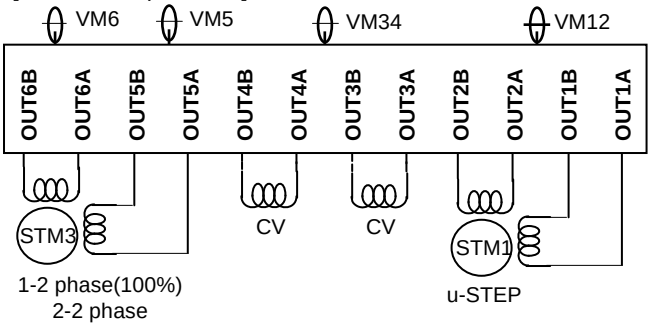


1ch	2ch	3ch	4ch	5ch	6ch
STM1		CV	CV	CC/FS	CC/FS
Serial autonomous control		1line control (IN3 or IN4 or IN5) or serial	1line control (IN3 or IN4 or IN5) or serial	1line control (IN3 or IN4 or IN5) or 2line control (IN3/IN4) (IN3/IN5) (IN4/IN5) or serial or serial (automatic PWM) or 1 line control (IN3or IN4 or IN5) FLL control serial +1line (IN3 or IN4 or IN5)	1line control (IN6) or 2 line control (IN5/IN6)

The control method of each CH is set through serial.
5ch FLL/automatic PWM control is only valid after FS mode is selected.

For CH3 & CH4 CV, the output is from a D-class amplifier and therefore the output is full swing PWM.

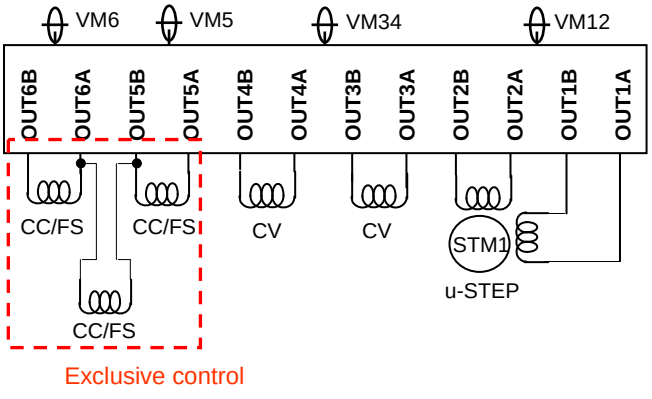
[Connection pattern 5]



1ch	2ch	3ch	4ch	5ch	6ch
STM1		CV	CV	STM3 CC/FS	
Serial autonomous control		1line control (IN3or IN4 or IN5) or serial	1line control (IN3or IN4 or IN5) or serial	3line control (IN4/IN5/IN6) or (IN3/IN5/IN6)	

The control method of each CH is set through serial.
For CH3 & CH4 CV, the output is from a D-class amplifier and therefore the output is full swing PWM.

[Connection pattern 6]



1ch	2ch	3ch	4ch	5ch	6ch	7ch
STM1		CV	CV	CC/FS	CC/FS	CC/FS
Serial autonomous control		1line control (IN3or IN4 or IN5) or serial	1line control (IN3or IN4 or IN5) or serial	1line control (IN3 or IN4 or IN5) or 2line control (IN3/IN4) (IN3/IN5) (IN4/IN5) or serial or Serial (automatic PWM) or 1line control (IN3or IN4 or IN5) FLL control serial +1line (IN3 or IN4 or IN5)	1line control (IN6) or 2line control (IN5/IN6)	Serial

The control method of each CH is set through serial.
5ch FLL/automatic PWM control is only valid after FS mode is selected.

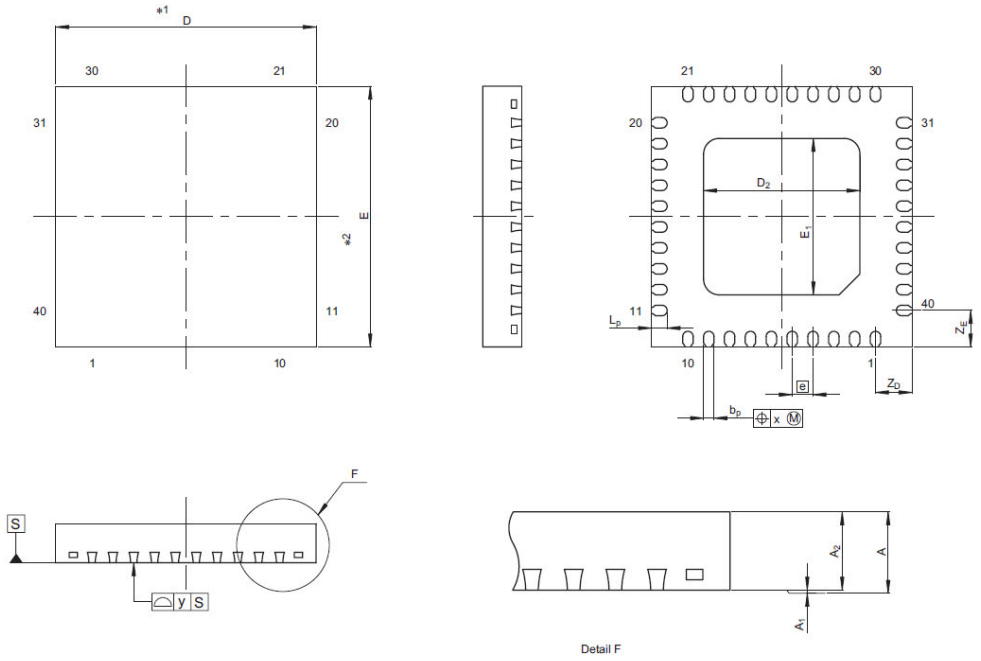
For CH3 & CH4 CV, the output is from a D-class amplifier and therefore the output is full swing PWM.

Exclusive Control
5ch,6ch,7ch cannot be simultaneously operated.
Only one channel is operated at a time.

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Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-HWQFN40-5x5-0.40	PWQN0040LD-A	40PJR-A	0.05g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	4.9	5.0	5.1
E	4.9	5.0	5.1
A_2	—	0.75	—
A	—	—	0.8
A_1	0	0	0.05
b_p	0.15	0.2	0.25
e	—	0.4	—
L_p	0.2	0.3	0.4
x	—	—	0.05
y	—	—	0.05
Z_D	—	0.7	—
Z_E	—	0.7	—
D_2	—	3.0	—
E_1	—	3.0	—

Ordering Information

Orderable Part No.	Package Code	Quantity
R2A30440NP#W0	PWQN0040LD-A	5000 pcs
R2A30440NP#U0	PWQN0040LD-A	1 pc

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