

R2A20162NS/SA/SP

8-bit 2ch D/A Converter with Buffer

R03DS0016EJ0100

Rev.1.00

2011.09.05

Description

The R2A20162 is an integrated circuit semiconductor of CMOS structure with 2 channels of built in D/A converters with output buffer op-amps. It is the electrical characteristic improvement version of the M62342.

Serial data transfer type input can easily be used through a combination of three lines: DI, CLK, and LD.

Outputs incorporate buffer op-amps that have a drive capacity of 1 mA or above for both sink source, and can operate over the entire voltage range from almost ground to Vcc (0 to 5V), making peripheral elements unnecessary and enabling configuration of a system with few component parts.

Very small SON package is added to lineup. It is suitable for a small mounting and reduces the mounting area.

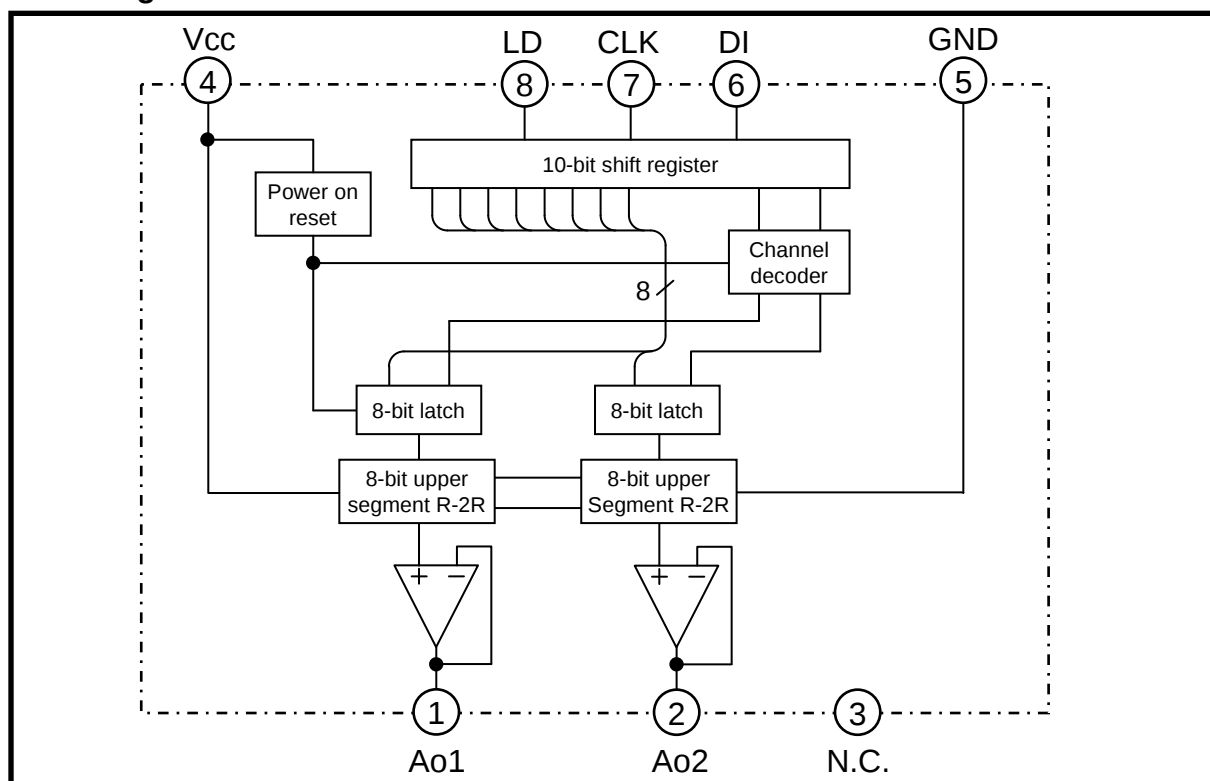
Features

- Guarantee Differential Nonlinearity error : $\pm 0.7\text{LSB}$, Nonlinearity error : $\pm 1.0\text{LSB}$,
- Data transfer format: 10-bit serial data input type by 3 wire (DI, SCK, LD)
- Output buffer op-amps: Operable over entire voltage range from almost ground to Vcc (0 to 5V)
- High output current capacity: $\pm 1\text{mA}$ or Higher
- Very small size package line-up: SON-8 (pin pitch: 0.5mm), TSSOP-8 (pin pitch 0.65mm)

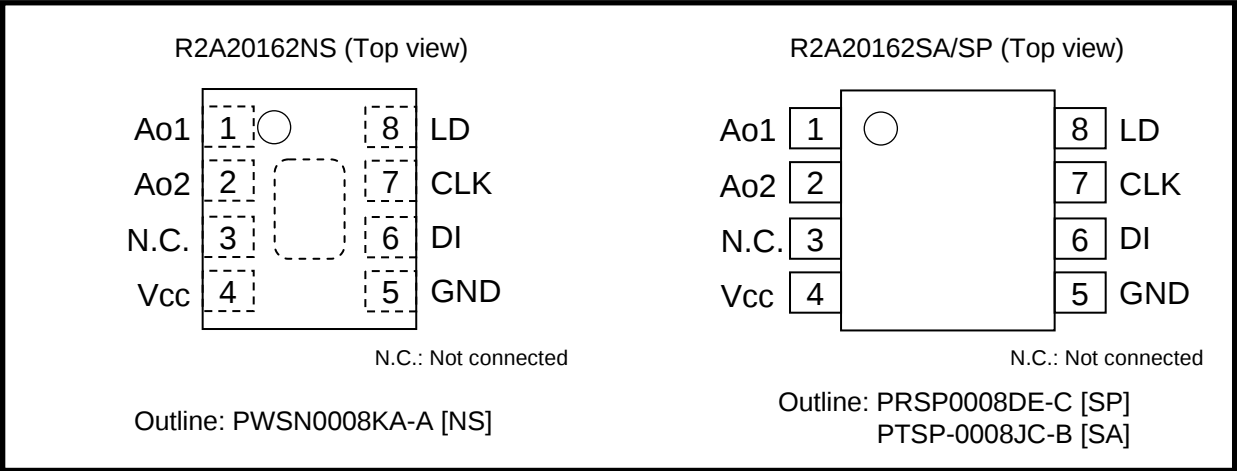
Application

- Conversion from digital data to analog control data for home-use and industrial equipment.
- Signal gain control or automatic adjustment of LCD-TV, PDP-TV or LCD display-monitor.
- Blurring correction control or various control of the interchangeable lens of digital camera for self adjustment by combination with microcomputer and EEPROM. (substitution of half fixed resistance)

Block Diagram



Pin Arrangement



Pin Description

Pin No.	Pin Name	Function
6	DI	Serial data input terminal. (Input serial data with a 10-bit data length.)
7	CLK	Serial clock input terminal (Input signal from DI terminal is input to 10-bit shift register at rise of serial clock.)
8	LD	Load terminal (When High level is input to LD terminal, value in 10-bit shift register is loaded into decoder and 8-bit latch.)
1	Ao1	8-bit resolution D/A converter output terminals (After power-on, all channels are reset and DAC data 00h is output.)
2	A02	
3	N.C.	Not connected
4	Vcc	Power supply terminal
5	GND	GND terminal

Absolute Maximum Ratings

(Ta= +25deg unless otherwise noted)

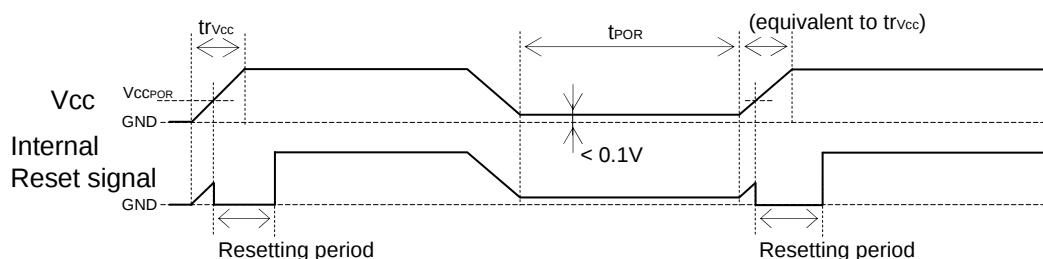
Item	Symbol	Conditions	Ratings	Unit
Supply voltage	Vcc		-0.3 to +6.5	V
Input voltage	Vin		-0.3 to Vcc+0.3 <6.5	V
Output voltage	Vo		-0.3 to Vcc+0.3 <6.5	V
Buffer amplifier output current	IAO	Continuous	-2.0 to +2.0	mA
Power dissipation	Pd	Ta=85deg	270(NS) / 200(SA) / 272(SP)	mW
Thermal derating factor	K theta	Ta>25deg	6.75(NS) / 5.0(SA) / 6.8(SP)	mW/deg
Operating temperature	Topr		-30 to +85	deg
Storage temperature	Tstg		-40 to +125	deg

Electrical Characteristics

(Vcc= +5V +/-10%, GND=0V, Ta= -30 to +85deg unless otherwise noted)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Supply voltage	Vcc		2.7	5.0	5.5	V
Supply current	Icc	CLK = 1MHz operation, IAO=0μA, DATA: 6Ah (at maximum current)	0	0.7	2.5	mA
		SDA = SCL = GND, IAO=0μA	0	0.5	1.6	mA
Supply voltage rise-up time *1	trvcc	Vcc=0 to 2.7V	100	—	—	μs
Operating voltage of Internal resetting *1	VCCPOR	Vcc=0 to 2.7V	—	1.5	1.9	V
Time period of re-power on (Power supply OFF → ON) *1	tPOR	Vcc < 0.1V	1	—	—	ms
Input leak current	IILK	VIN= 0 to Vcc	-10	—	10	μA
Input low voltage	VIL		0	—	0.2Vcc	V
Input high voltage	VIH	4.0V < Vcc	0.5Vcc	—	Vcc	V
		Vcc < 4.0V	0.8Vcc	—	Vcc	V
Buffer amplifier output voltage range	VAO	IAO= +/-100μA	0.1	—	Vcc-0.1	V
		IAO= +/-500μA	0.2	—	Vcc-0.2	
Buffer amplifier output drive range	IAO	Upper side saturation voltage = 0.3V Lower side saturation voltage = 0.2V	-1.0	—	1.0	mA
Differential nonlinearity	SDL	Vcc=5.12V (20mV/ LSB), without load (IAO= 0μA)	-0.7	—	0.7	LSB
Nonlinearity	SL		-1.0	—	1.0	LSB
Zero code error	SZERO		-2.0	—	2.0	LSB
Full scale error	SFULL		-2.0	—	2.0	LSB
Output capacitate load	Co		—	—	0.1	μF
Buffer amplifier output impedance	Ro		—	5.0	—	ohm

*1 : When power supply is turned on, internal circuit is initialized by power on reset circuit. But, if re-powered on quickly, initialize is not operate. So, keep the time period of re-powered on (tPOR).

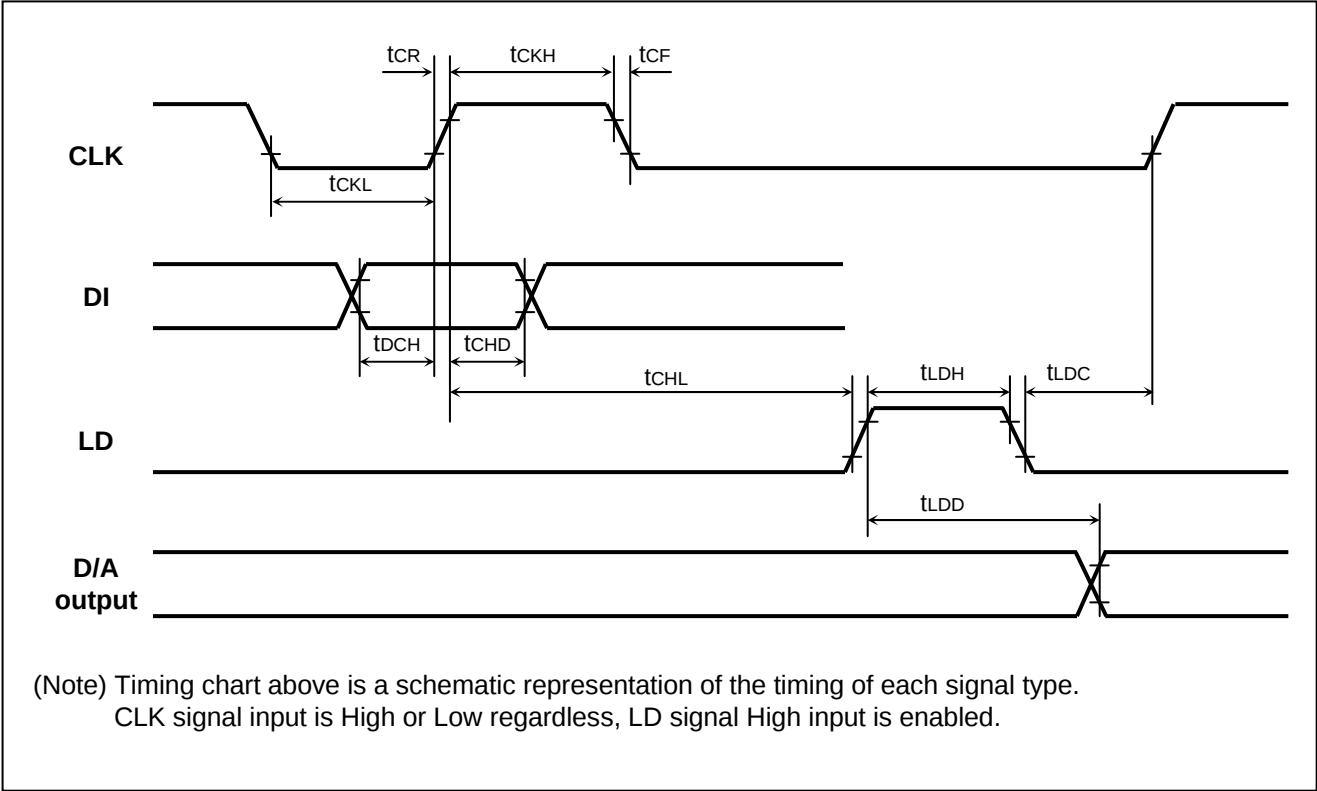


AC Characteristics

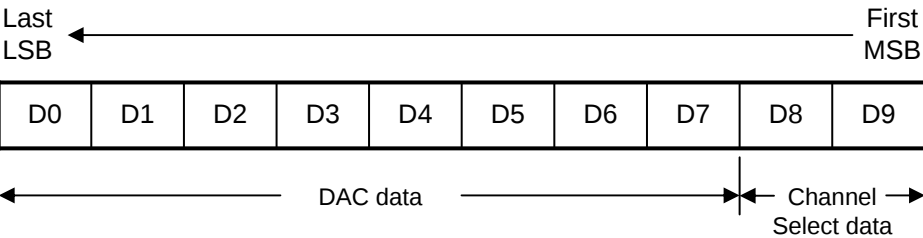
(Vcc = +5V +/-10deg, GND = 0V, Ta = -30 to +85deg unless otherwise noted)

Item	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Clock frequency	fCLK		-	1.0	10	MHz
Clock high pulse width	tCKH		40	-	-	ns
Clock low pulse width	tCKL		40	-	-	ns
Clock rise time	tCR		-	-	200	ns
Clock fall time	tCF		-	-	200	ns
Data setup time	tDCH		5	-	-	ns
Data hold time	tCHD		30	-	-	ns
Load setup time	tCHL		40	-	-	ns
Load hold time	tLDC		40	-	-	ns
Load high pulse width	tLDH		40	-	-	ns
D/A output settling time	tLDD	Ta=25deg, CL<100pF, VAO: 0.5↔4.5V, The time until the output becomes the final value of 1/2 LSB.	-	-	150	μs

Timing Chart



Digital Data Format



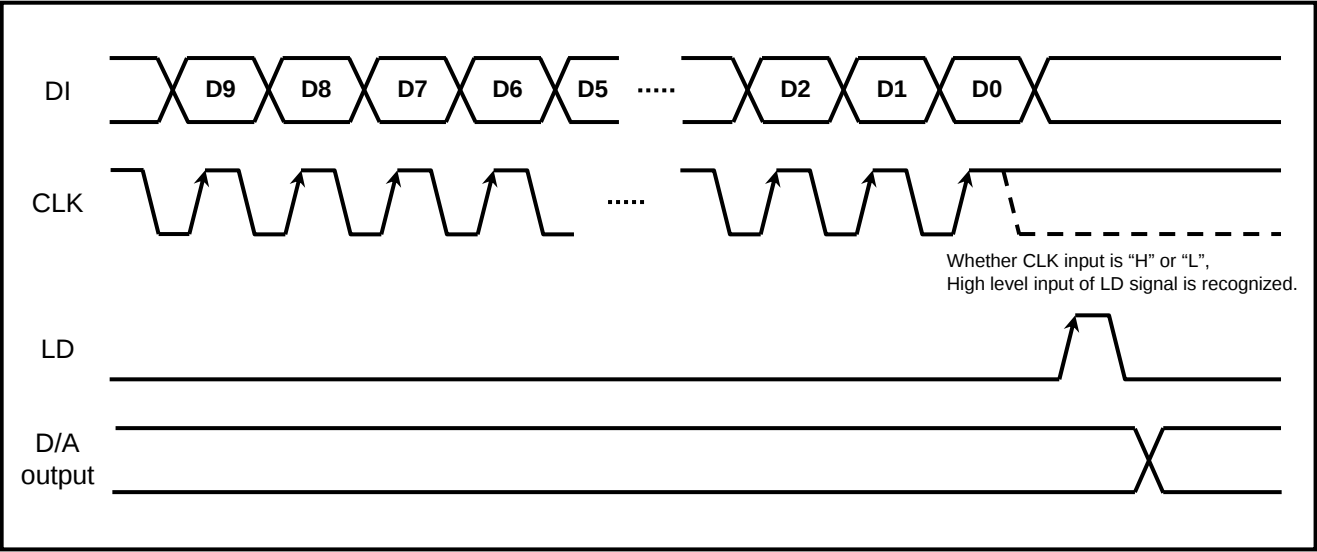
Channel select data

D8	D9	Channel selection
0	0	Ao1 selected
1	0	Ao2 selected
0	1	Don't care
1	1	Don't care

DAC data

D0	D1	D2	D3	D4	D5	D6	D7	DAC output
0	0	0	0	0	0	0	0	$V_{cc}/256 \times 1$
1	0	0	0	0	0	0	0	$V_{cc}/256 \times 2$
0	1	0	0	0	0	0	0	$V_{cc}/256 \times 3$
1	1	0	0	0	0	0	0	$V_{cc}/256 \times 4$
:	:	:	:	:	:	:	:	:
0	1	1	1	1	1	1	1	$V_{cc}/256 \times 255$
1	1	1	1	1	1	1	1	V_{cc}

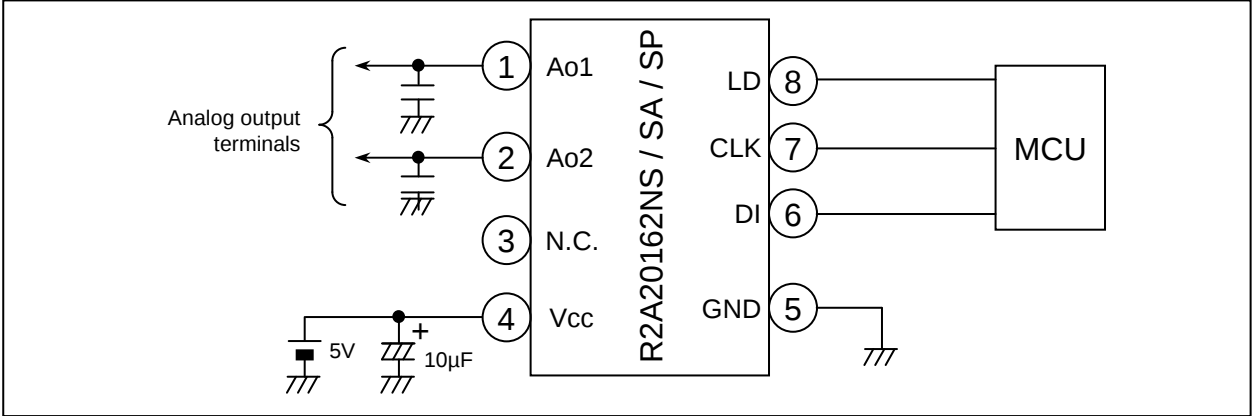
Data timing chart (Model)



Precaution For use

- Supply voltage terminal (Vcc) is also used for D/A converter upper reference voltage setting. If ripple or spike is input this terminal, accuracy of D/A converter is down, So, when use this device, please connect capacitor among Vcc to GND for stable D/A conversion.
- This IC's output amplifier has an advantage to capacitive load, So, it's no problem at device action when connect capacitor (0.1 μF Max) among output to GND for every noise elimination.

Application Example

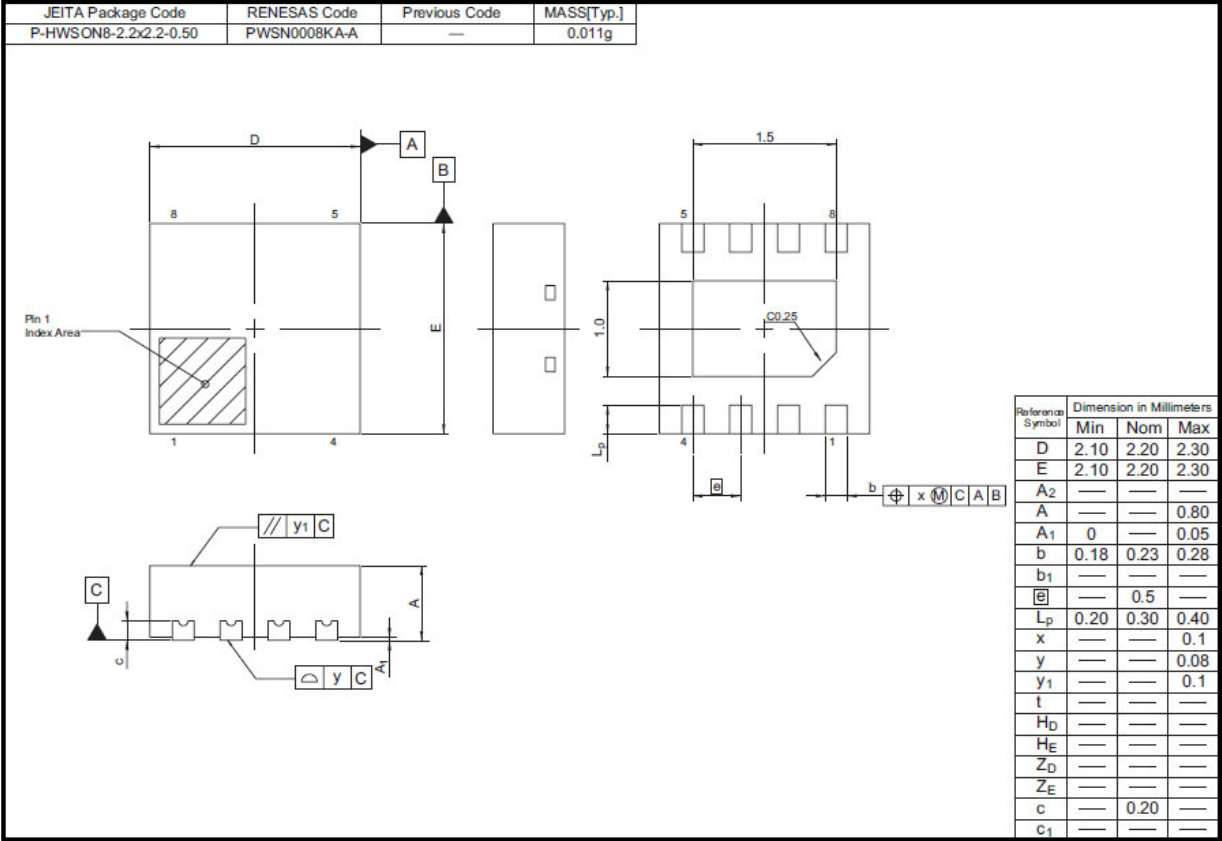


Ordering Information

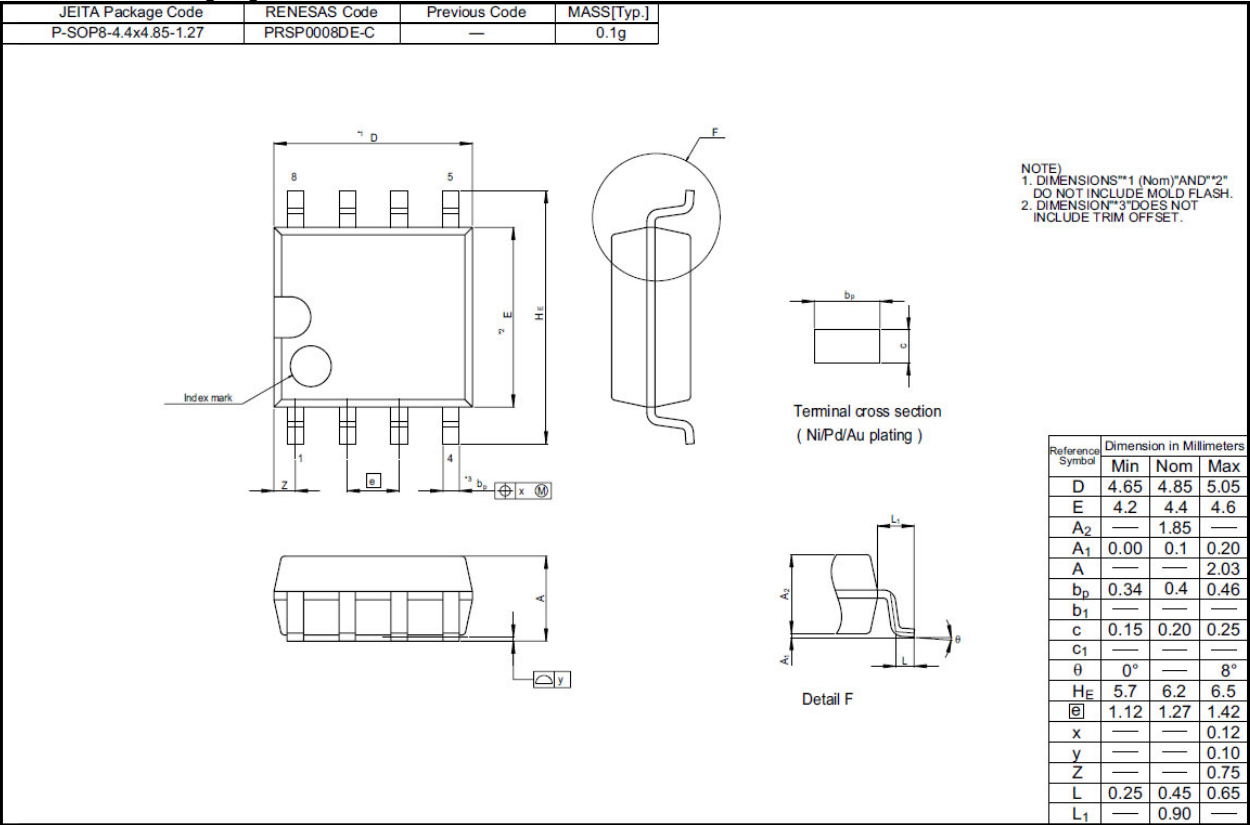
Order part No.	Package Name	Package Code	Package type No.	Packing/Quantity
R2A20162SP	SOP-8	PRSP0008DE-C	SP	Embossed Taping/2,500 pcs.
R2A20162SA	TSSOP-8	RTSP0008JC-B	SA	Embossed Taping/3,000 pcs.
R2A20162NS	SON-8	PWSN0008KA-A	NS	Embossed Taping/5,000 pcs.

Package Dimensions

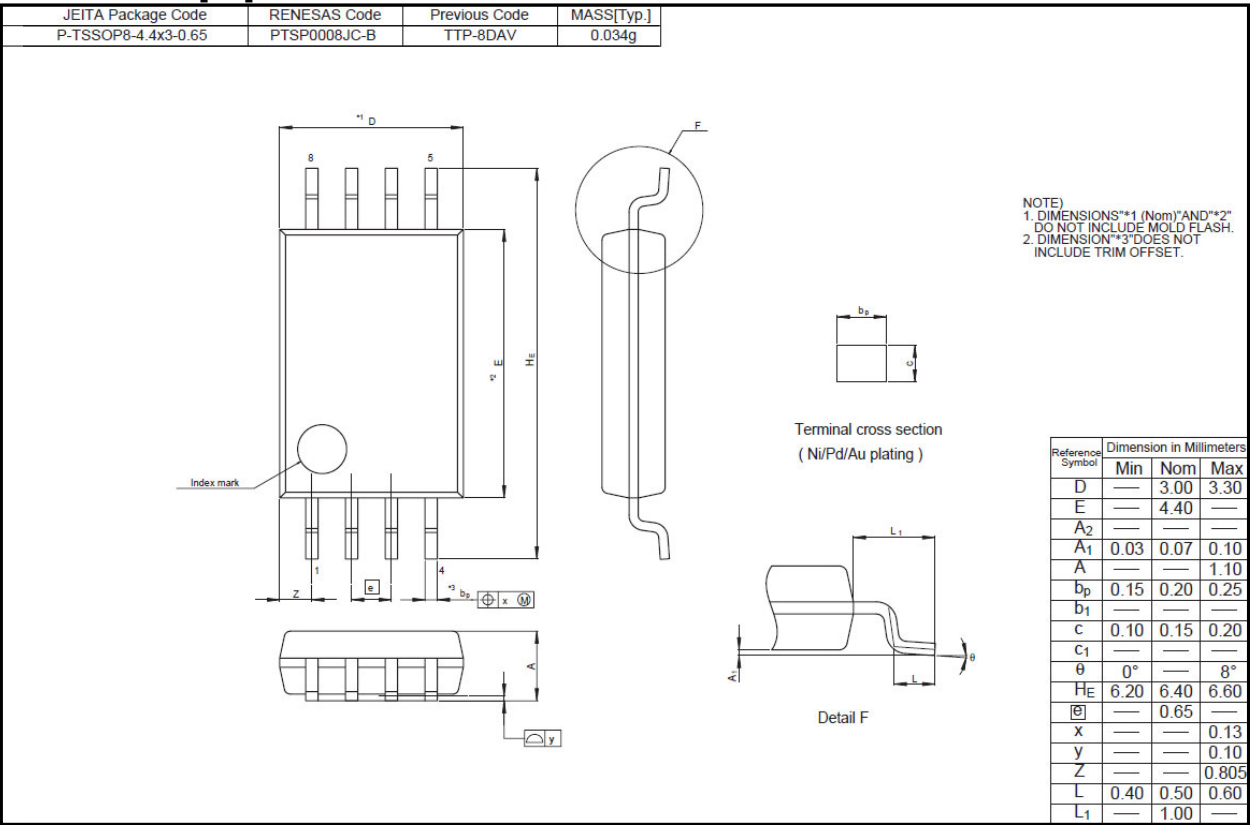
PWSN0008KA-A [NS]



PRSP0008DE-C [SP]



PTSP0008JC-B [SA]



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Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
11F., Samik Laved' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141