

HA17324A Series

Quad Operational Amplifier

REJ03D0674-0400

Rev.4.00

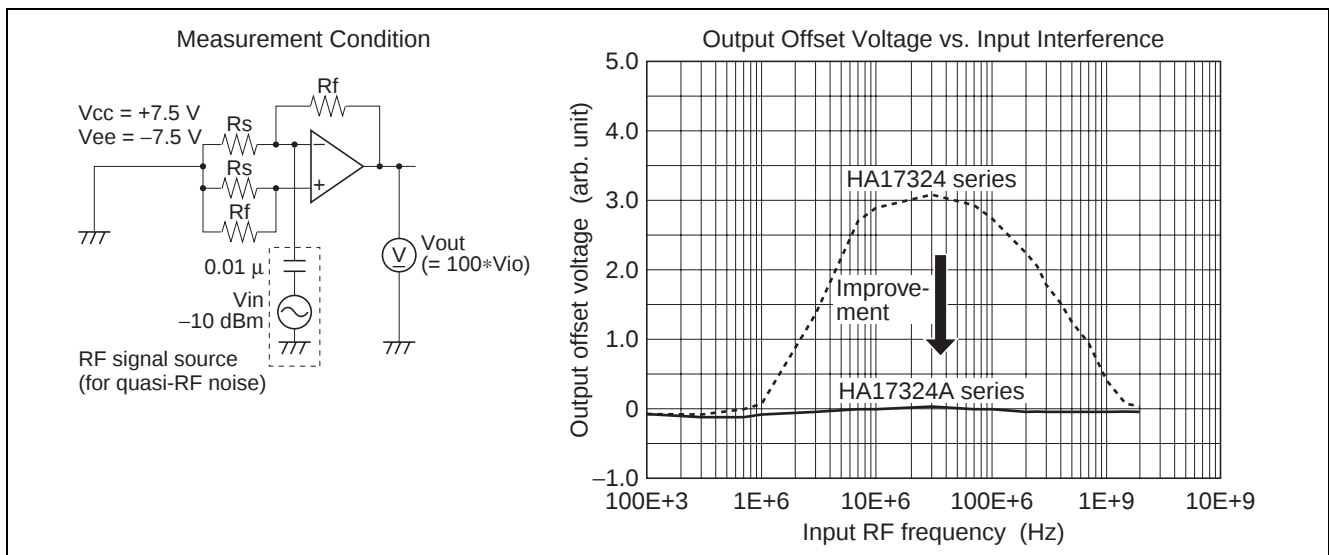
Mar 10, 2006

Description

HA17324A series are quad operational amplifier that provide high gain and internal phase compensation, with single power supply. They can be widely used to control equipments.

Features

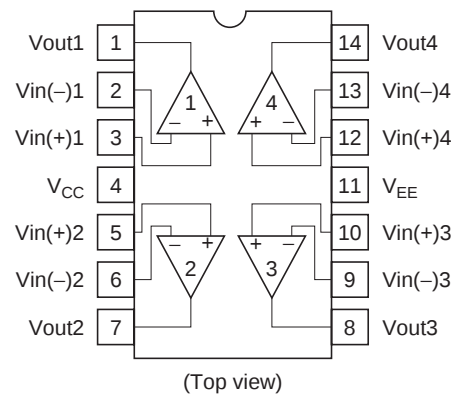
- Wide range of supply voltage, and single power supply used
- Internal phase compensation
- Wide range of common mode voltage, and possible to operate with an input about 0 V
- Low electro-magnetic susceptibility level



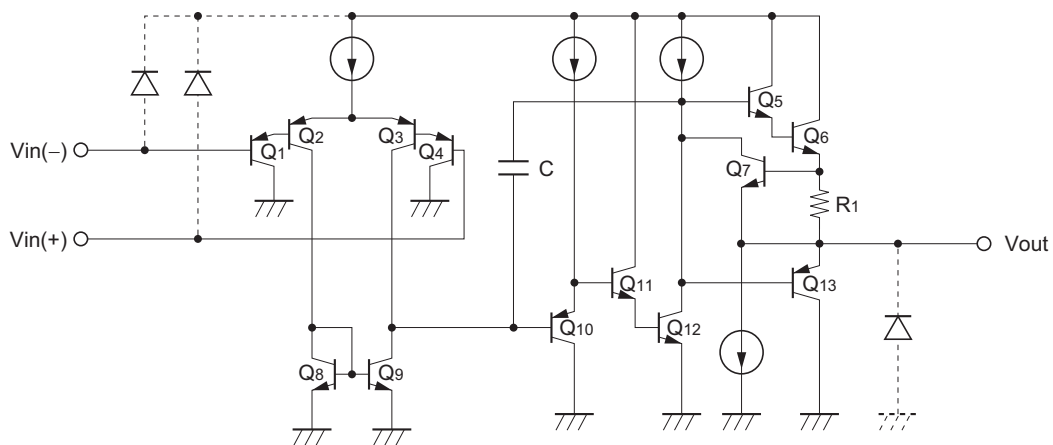
Ordering Information

Type No.	Application	Package Name	Package Code
HA17324A	Commercial use	DIP-14 pin	PRDP0014AB-B
HA17324AF		SOP-14 pin (JEITA)	PRSP0014DF-B
HA17324ARP		SOP-14 pin (JEDEC)	PRSP0014DE-A
HA17324AT		TSSOP-14 pin	PTSP0014JA-B

Pin Arrangement



Circuit Schematic (1/4)



Note: If Input/Output terminals voltage over the absolute maximum ratings, there is possibility of mis-operation, characteristics deterioration and destruction, because of the current's flowing to parasitic diode in IC. The Input/Output terminals are recommended to be protected with the clamp circuit which using the diode with low forward voltage (like schottky barrier diode) when there is a possibility for the Input/Output terminals voltage exceeds the absolute maximum ratings.

Absolute Maximum Ratings

(Ta = 25°C)

Item		Symbol	Ratings	Unit
Power supply voltage		V _{CC}	32	V
Output sink current		I _{osink}	50	mA
Common mode input voltage		V _{CM}	−0.3 to +V _{CC}	V
Differential input voltage		V _{in(diff)}	±V _{CC}	V
Output voltage		V _{out}	−0.3 to +V _{CC}	V
Allowable power dissipation	DIP	P _T	625 * ²	mW
	SOP		625 * ³	
	TSSOP		400 * ⁴	
Operating temperature		Topr	−40 to +85	°C
Storage temperature		Tstg	−55 to +125	°C

Notes: 1. HA17324A:

This is the allowable values up to Ta = 50°C. Derate by 8.3 mW/°C.

2. HA17324AF/ARP:

When it is mounted on glass epoxy board of 40 mm × 40 mm × 1.6 mm with 10% wiring density, value at Ta ≤ 25°C. If Ta > 25°C, derated by 6.25 mW/°C.

When it is mounted on glass epoxy board of 40 mm × 40 mm × 1.6 mm with 30% wiring density. If Ta > 32°C, derated by 6.70 mW/°C.

3. HA17324AT:

These are the allowable values up to Ta = 25°C. Derate by 4 mW/°C above that temperature.

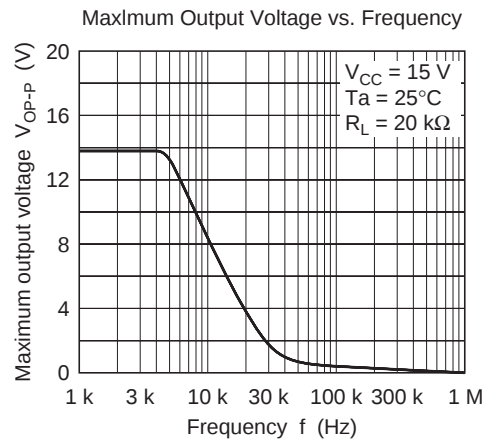
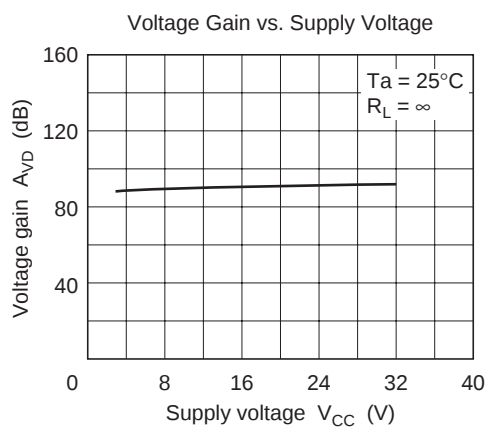
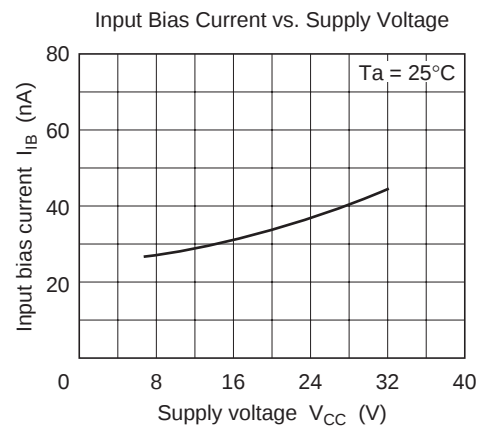
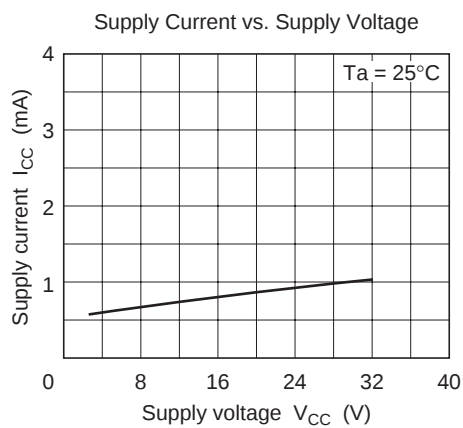
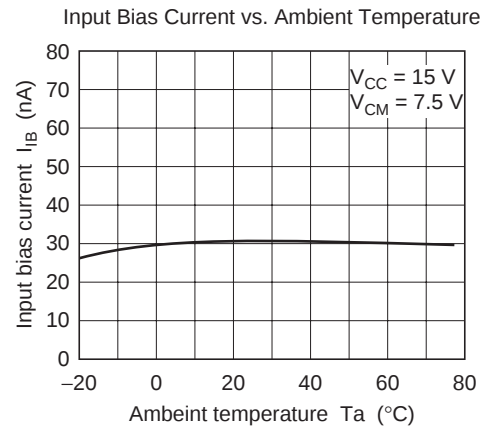
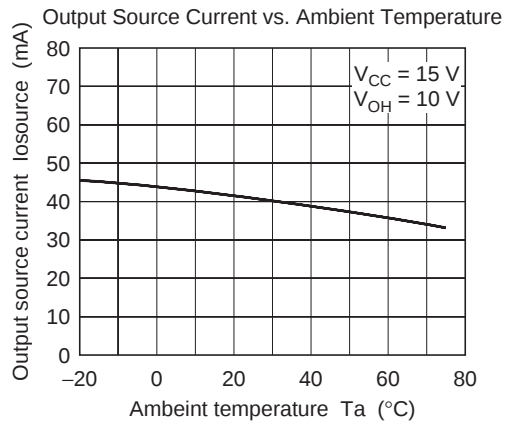
Electrical Characteristics

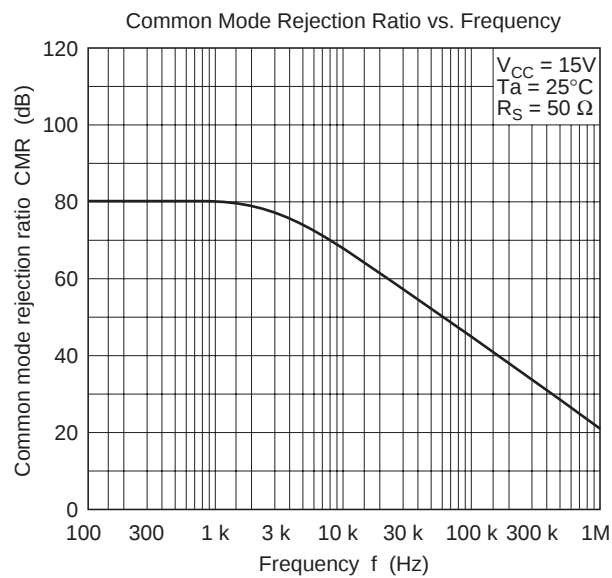
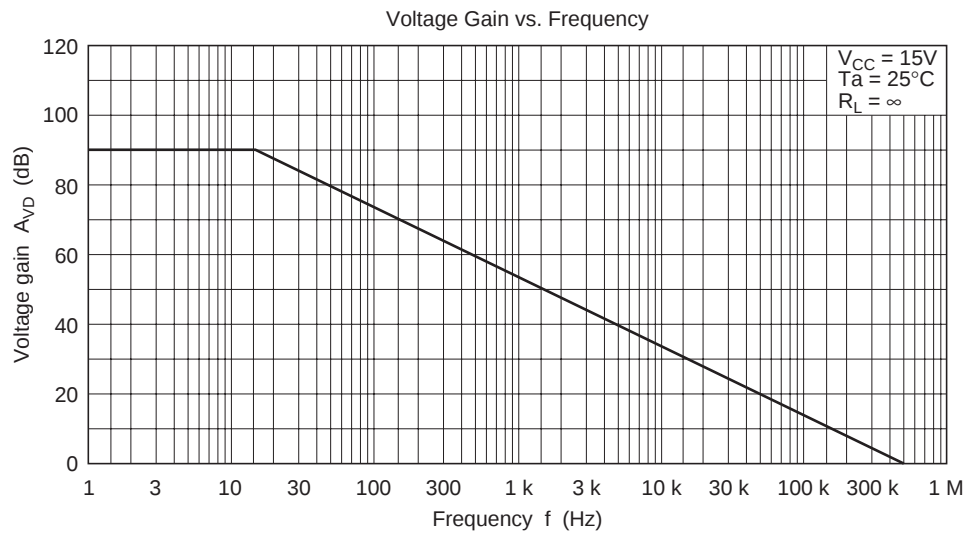
(V_{CC} = +15 V, Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage	V _{IO}	—	2	7	mV	V _{CM} = 7.5 V, R _S = 50 Ω, R _f = 50 kΩ
Input offset current	I _{IO}	—	5	50	nA	V _{CM} = 7.5 V, I _{IO} = I _{I(−)} − I _{I(+)}
Input bias current	I _{IB}	—	30	500	nA	V _{CM} = 7.5 V
Power source rejection ratio	PSRR	—	93	—	dB	f = 100 Hz, R _S = 1 kΩ, R _j = 100 kΩ
Voltage gain	A _{VD}	75	90	—	dB	R _S = 1 kΩ, R _f = 100 kΩ, R _L = ∞
Common mode rejection ratio	CMR	—	80	—	dB	R _S = 50 Ω, R _f = 5 kΩ
Common mode input voltage range	V _{CM}	−0.3	—	13.5	V	R _S = 1 kΩ, R _f = 100 kΩ, f = 100 Hz
Maximum output voltage	V _{OP-P}	—	13.6	—	V	f = 100 Hz, R _S = 1 kΩ, R _f = 100 kΩ, R _L = 20 kΩ
Output source current	I _{osource}	20	40	—	mA	V _{IN} ⁺ = 1 V, V _{IN} [−] = 0 V, V _{OH} = 10 V
Output sink current	I _{osink}	10	20	—	mA	V _{IN} = 0 V, V _{IN} = 1 V, V _{OL} = 2.5 V
Supply current	I _{CC}	—	0.8	2	mA	V _{IN} = GND, R _L = ∞
Slew rate	SR	—	0.19	—	V/μs	f = 1.5 kHz, V _{CM} = 7.5 V, R _L = ∞
Channel separation * ¹	CS	—	(120)	—	dB	f = 1 kHz
Output sink current	I _{osink}	15	50	—	μA	V _{IN} ⁺ = 0 V, V _{IN} [−] = 1 V, V _{OL} = 200 mV
		3	9	—	mA	V _{IN} ⁺ = 0 V, V _{IN} [−] = 1 V, V _{OL} = 1 V
Output voltage	V _{OH1}	13.2	13.6	—	V	I _{OH} = −1 mA
	V _{OH2}	12.0	13.3	—	V	I _{OH} = −10 mA
Output voltage	V _{OL1}	—	0.8	1.0	V	I _{OL} = 1 mA
	V _{OL2}	—	1.1	1.8	V	I _{OL} = 10 mA

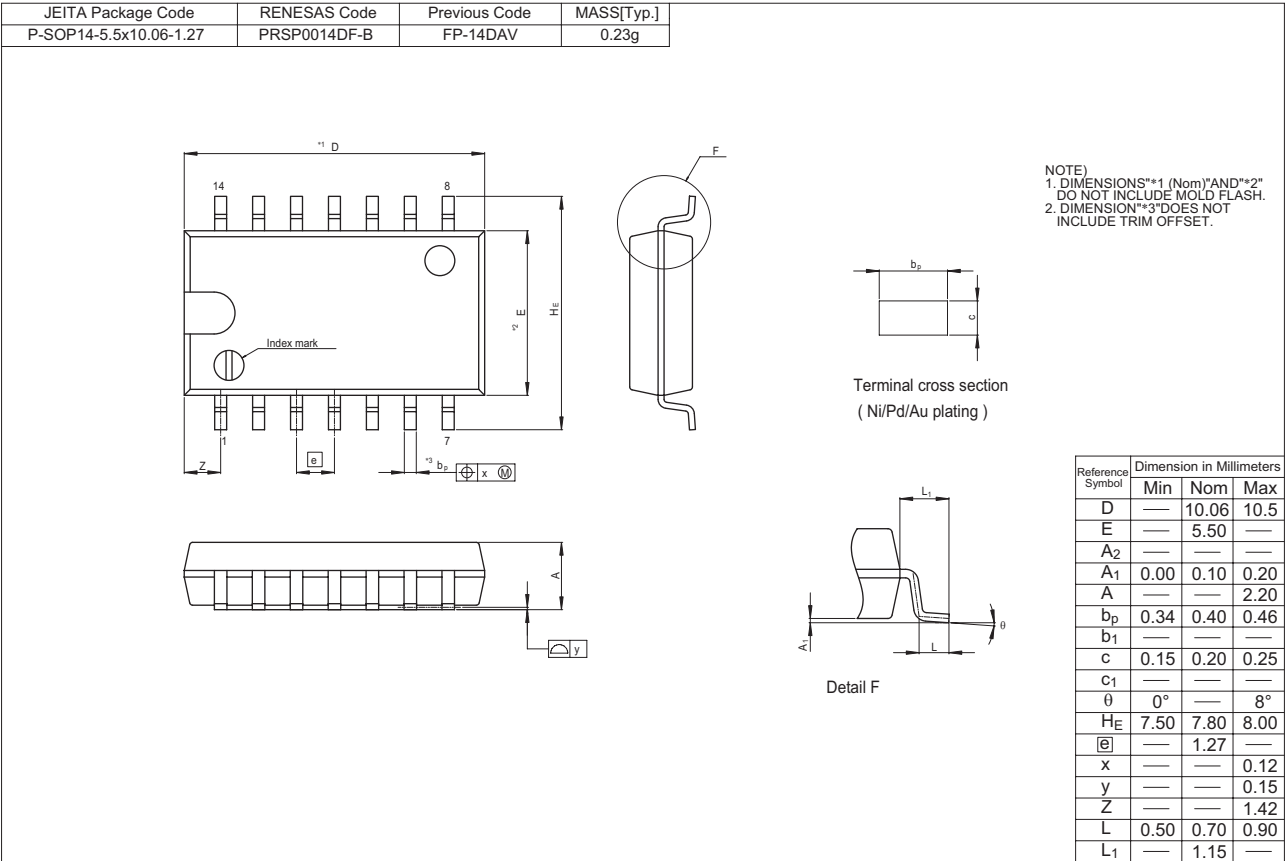
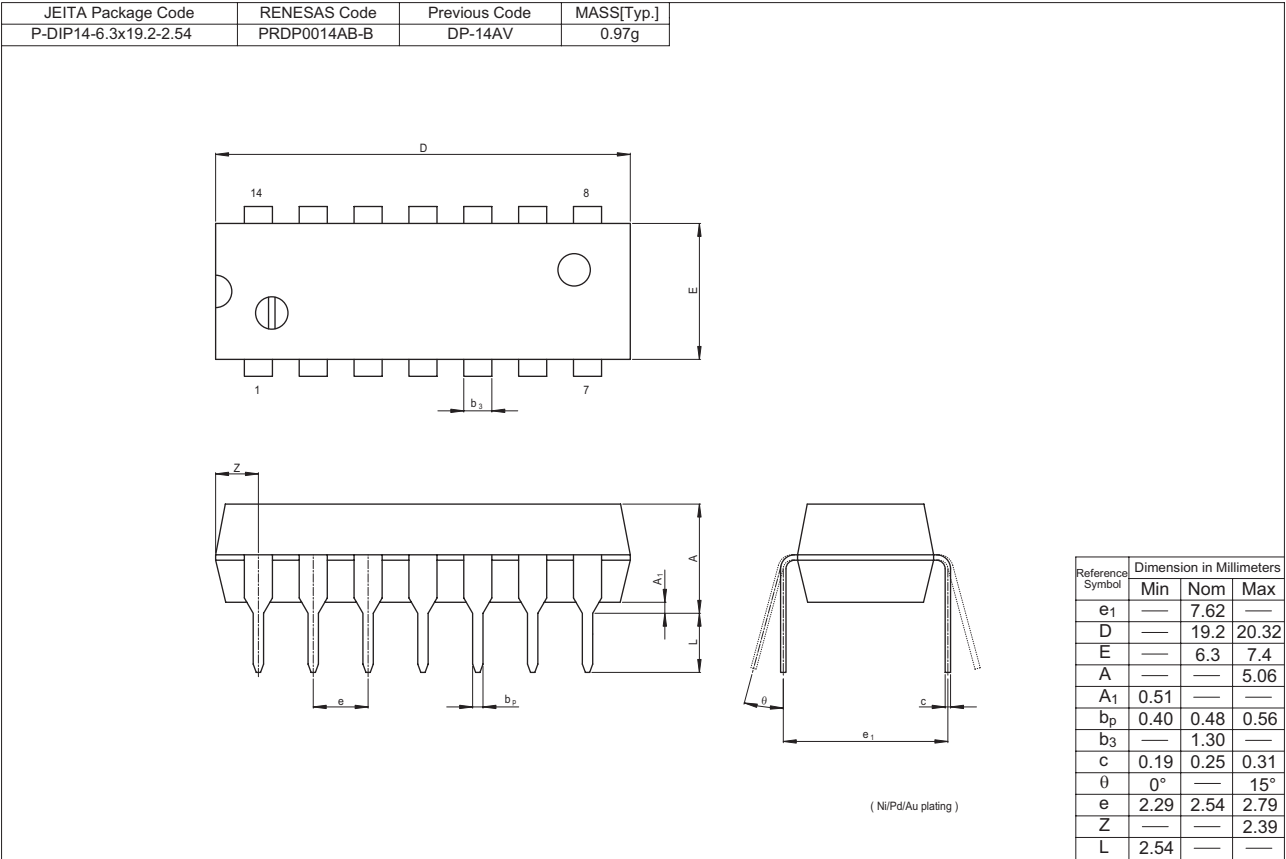
Note: 1. Design spec.

Characteristic Curves



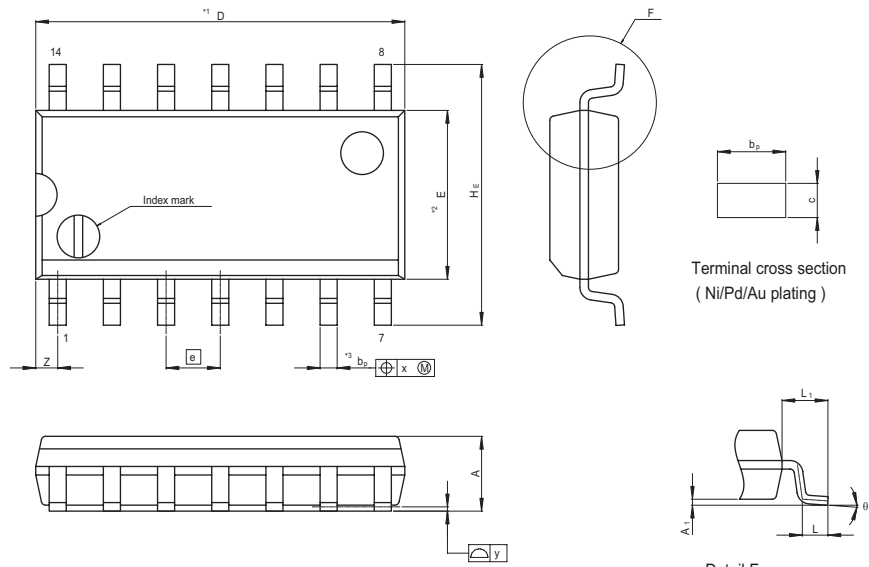


Package Dimensions



HA17324A Series

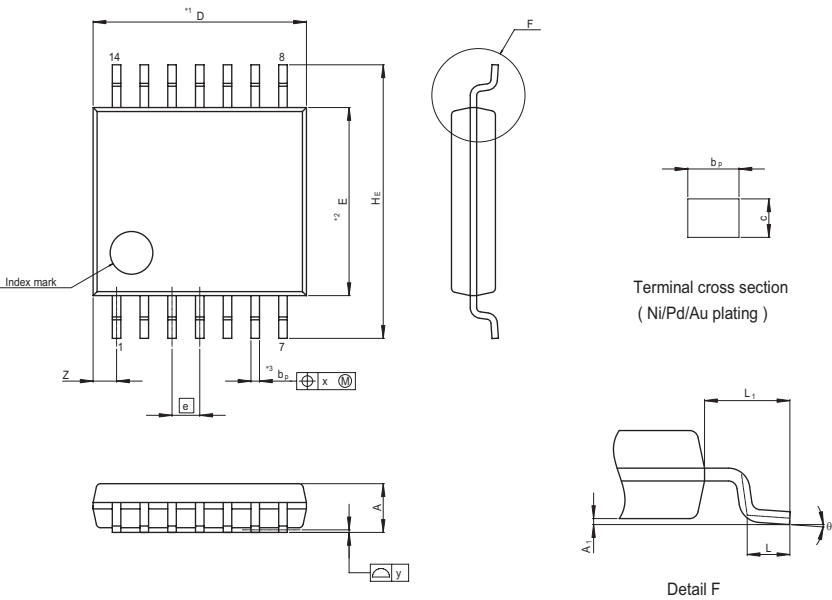
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP14-3.95x8.65-1.27	PRSP0014DE-A	FP-14DNV	0.13g



NOTE)
1. DIMENSIONS**1 (Nom)**AND**2*
DO NOT INCLUDE MOLD FLASH.
2. DIMENSION**3*DOES NOT
INCLUDE TRIM OFFSET.

Reference Symbol	Min	Nom	Max
D	—	8.65	9.05
E	—	3.95	—
A ₂	—	—	—
A ₁	0.10	0.14	0.25
A	—	—	1.75
b _P	0.34	0.40	0.46
b ₁	—	—	—
c	0.15	0.20	0.25
c ₁	—	—	—
θ	0°	—	8°
H _E	5.80	6.10	6.20
Ⓜ	—	1.27	—
x	—	—	0.25
y	—	—	0.15
z	—	—	0.635
L	0.40	0.60	1.27
L ₁	—	1.08	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-TSSOP14-4.4x5-0.65	PTSP0014JA-B	TTP-14DV	0.05g



NOTE)
1. DIMENSIONS**1 (Nom)**AND**2*
DO NOT INCLUDE MOLD FLASH.
2. DIMENSION**3*DOES NOT
INCLUDE TRIM OFFSET.

Reference Symbol	Min	Nom	Max
D	—	5.00	5.30
E	—	4.40	—
A ₂	—	—	—
A ₁	0.03	0.07	0.10
A	—	—	1.10
b _P	0.15	0.20	0.25
b ₁	—	—	—
c	0.10	0.15	0.20
c ₁	—	—	—
θ	0°	—	8°
H _E	6.20	6.40	6.60
Ⓜ	—	0.65	—
x	—	—	0.13
y	—	—	0.10
z	—	—	0.83
L	0.4	0.5	0.6
L ₁	—	1.0	—

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

Keep safety first in your circuit designs!

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.
Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corp. product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corp. or a third party.
2. Renesas Technology Corp. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corp. without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor for the latest product information before purchasing a product listed herein.
The information described here may contain technical inaccuracies or typographical errors.
Renesas Technology Corp. assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.
Please also pay attention to information published by Renesas Technology Corp. by various means, including the Renesas Technology Corp. Semiconductor home page (<http://www.renesas.com>).
4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corp. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corp. semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corp. is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corp. for further details on these materials or the products contained therein.



RENESAS SALES OFFICES

<http://www.renesas.com>

Refer to "<http://www.renesas.com/en/network>" for the latest and detailed information.

Renesas Technology America, Inc.

450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.

Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

Renesas Technology Hong Kong Ltd.

7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.

10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology Singapore Pte. Ltd.

1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.

Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd

Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510