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Old Company Name in Catalogs and Other Documents

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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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HA17324A Series

Quad Operational Amplifier

REJ03D0674-0400

Rev.4.00

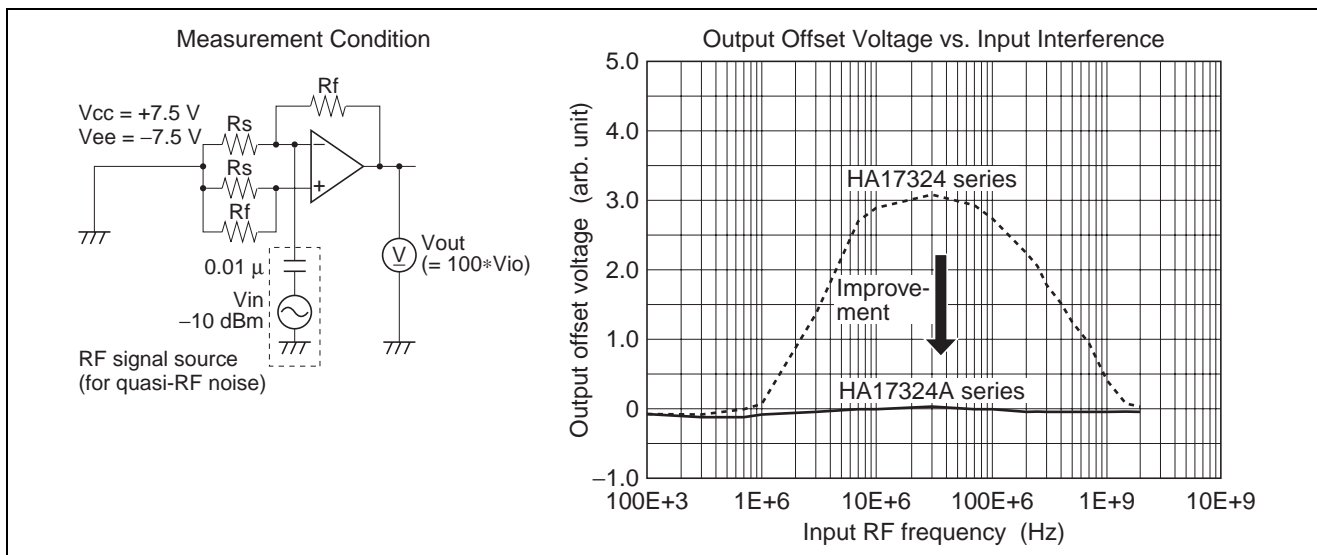
Mar 10, 2006

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

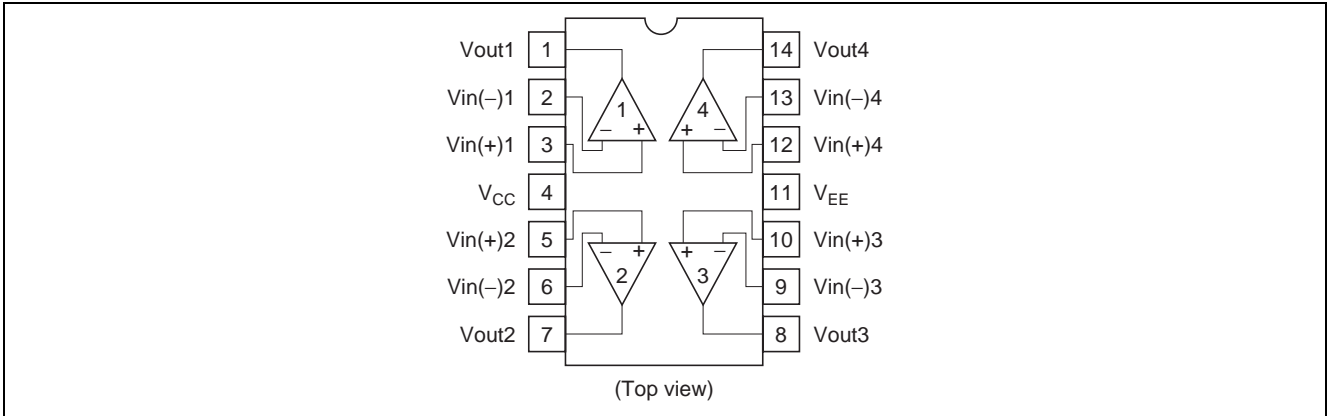
- Wide range of supply voltage, and single power supply used
- Internal phase compensation
- Wide range of common mode voltage, and possible to operate with an input about 0 V
- Low electro-magnetic susceptibility level



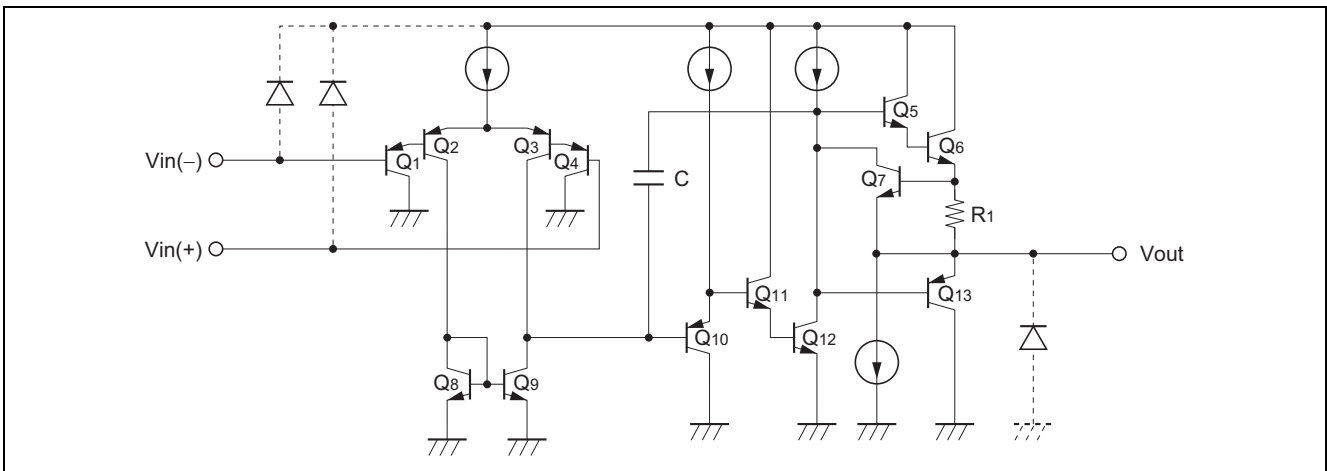
Ordering Information

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	mW
	SOP		
	TSSOP		
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.

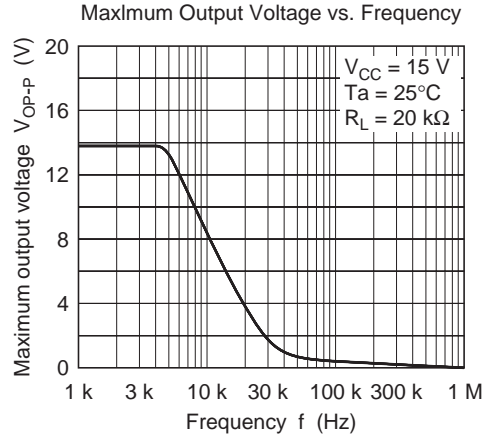
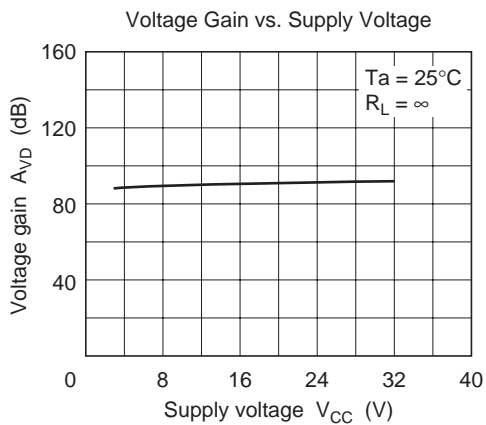
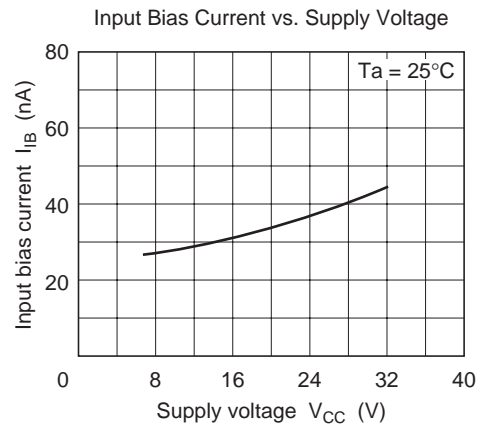
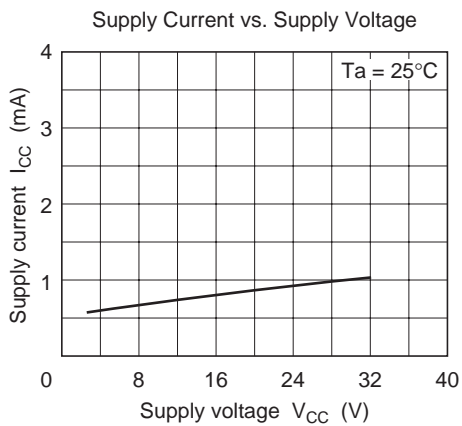
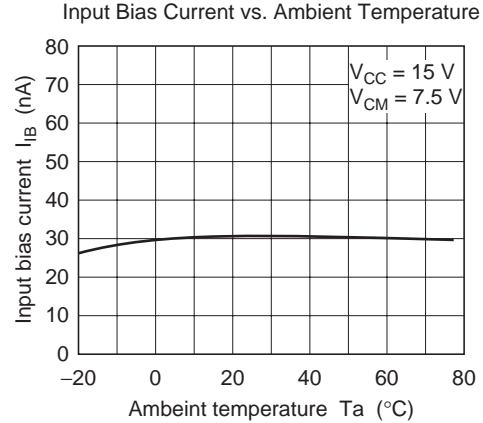
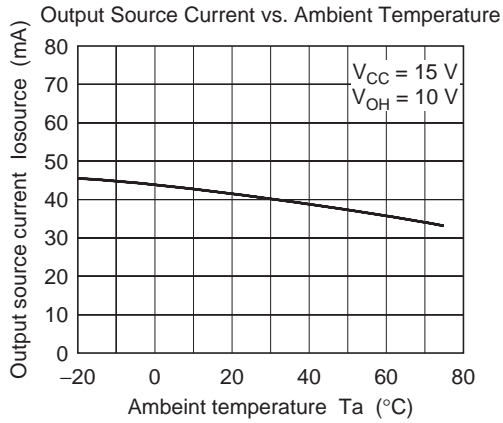
Electrical Characteristics

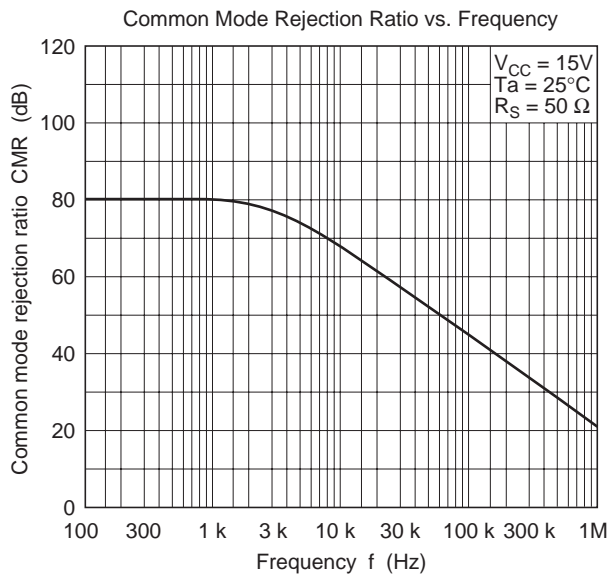
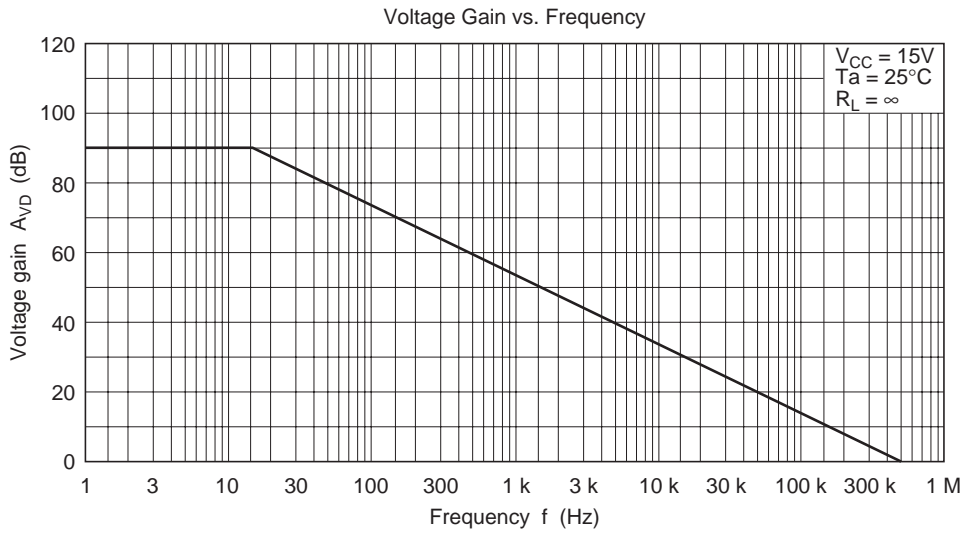
(V_{CC} = +15 V, Ta = 25°C)

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.

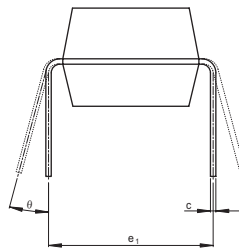
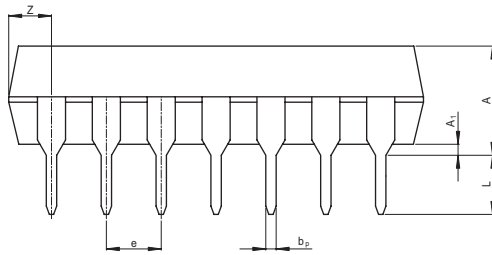
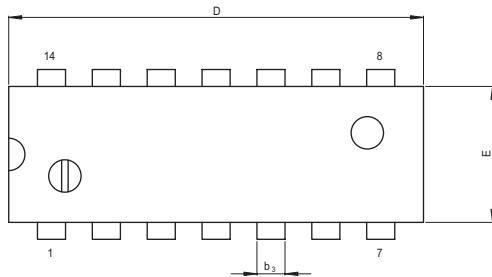
Characteristic Curves





Package Dimensions

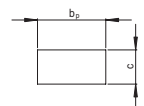
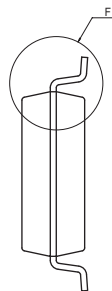
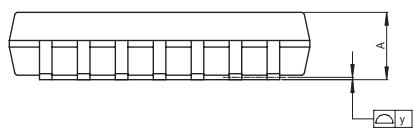
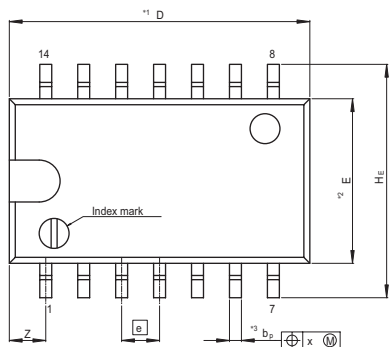
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP14-6.3x19.2-2.54	PRDP0014AB-B	DP-14AV	0.97g



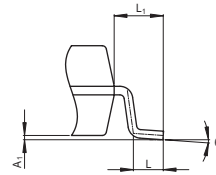
(Ni/Pd/Au plating)

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e ₁	—	7.62	—
D	—	19.2	20.32
E	—	6.3	7.4
A	—	—	5.06
A ₁	0.51	—	—
b _p	0.40	0.48	0.56
b ₃	—	1.30	—
c	0.19	0.25	0.31
θ	0°	—	15°
e	2.29	2.54	2.79
Z	—	—	2.39
L	2.54	—	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP14-5.5x10.06-1.27	PRSP0014DF-B	FP-14DAV	0.23g



Terminal cross section (Ni/Pd/Au plating)



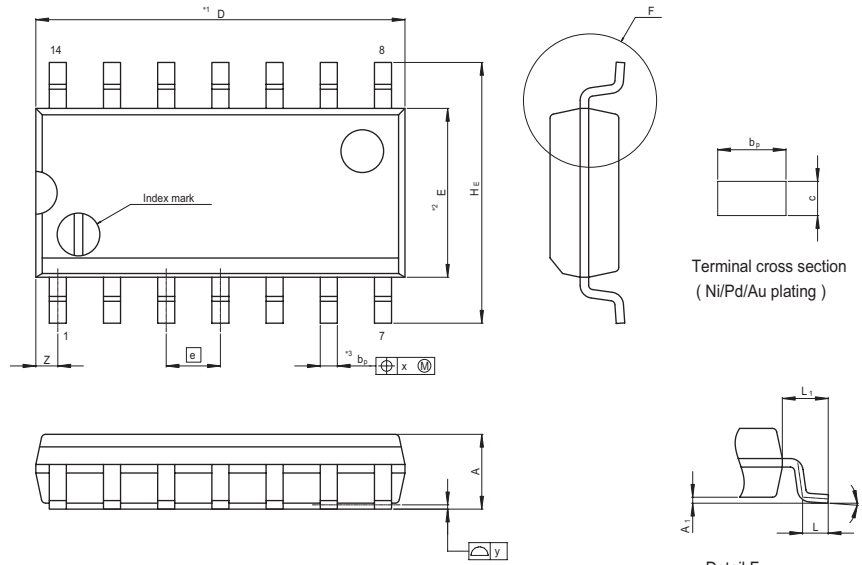
Detail F

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

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	10.06	10.5
E	—	5.50	—
A ₂	—	—	—
A ₁	0.00	0.10	0.20
A	—	—	2.20
b _p	0.34	0.40	0.46
b ₁	—	—	—
c	0.15	0.20	0.25
c ₁	—	—	—
θ	0°	—	8°
H _E	7.50	7.80	8.00
Ⓞ	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	1.42
L	0.50	0.70	0.90
L ₁	—	1.15	—

HA17324A Series

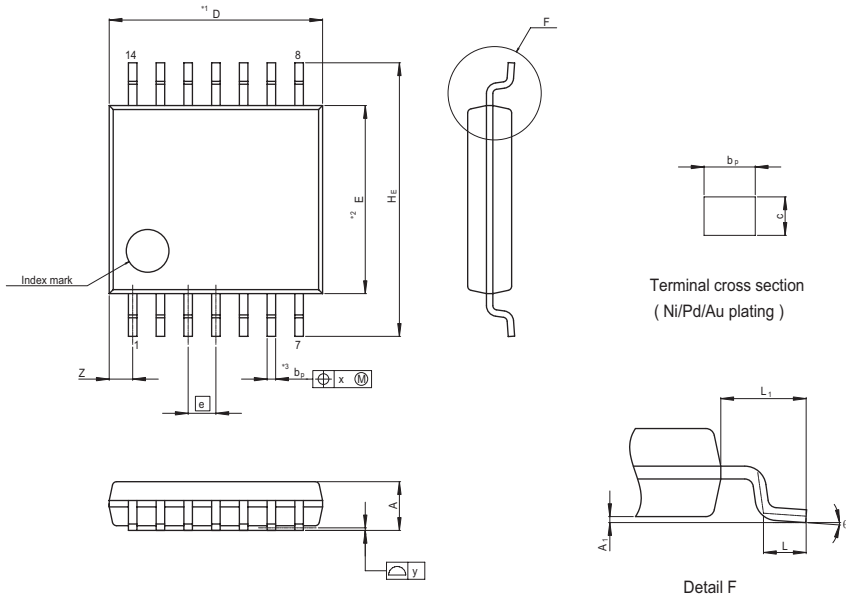
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP14-3.95x8.65-1.27	PRSP0014DE-A	FP-14DNV	0.13g



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 2. DIMENSION**3*DOES NOT
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Reference Symbol	Dimension in Millimeters		
	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



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 2. DIMENSION**3*DOES NOT
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Reference Symbol	Dimension in Millimeters		
	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	—

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