HA17903A Series

Dual Comparators

REJ03D0807-0100
Rev.1.00
Mar 10, 2005

Description

The HA17903A series products are comparators designed for general purpose, especially for power control systems.

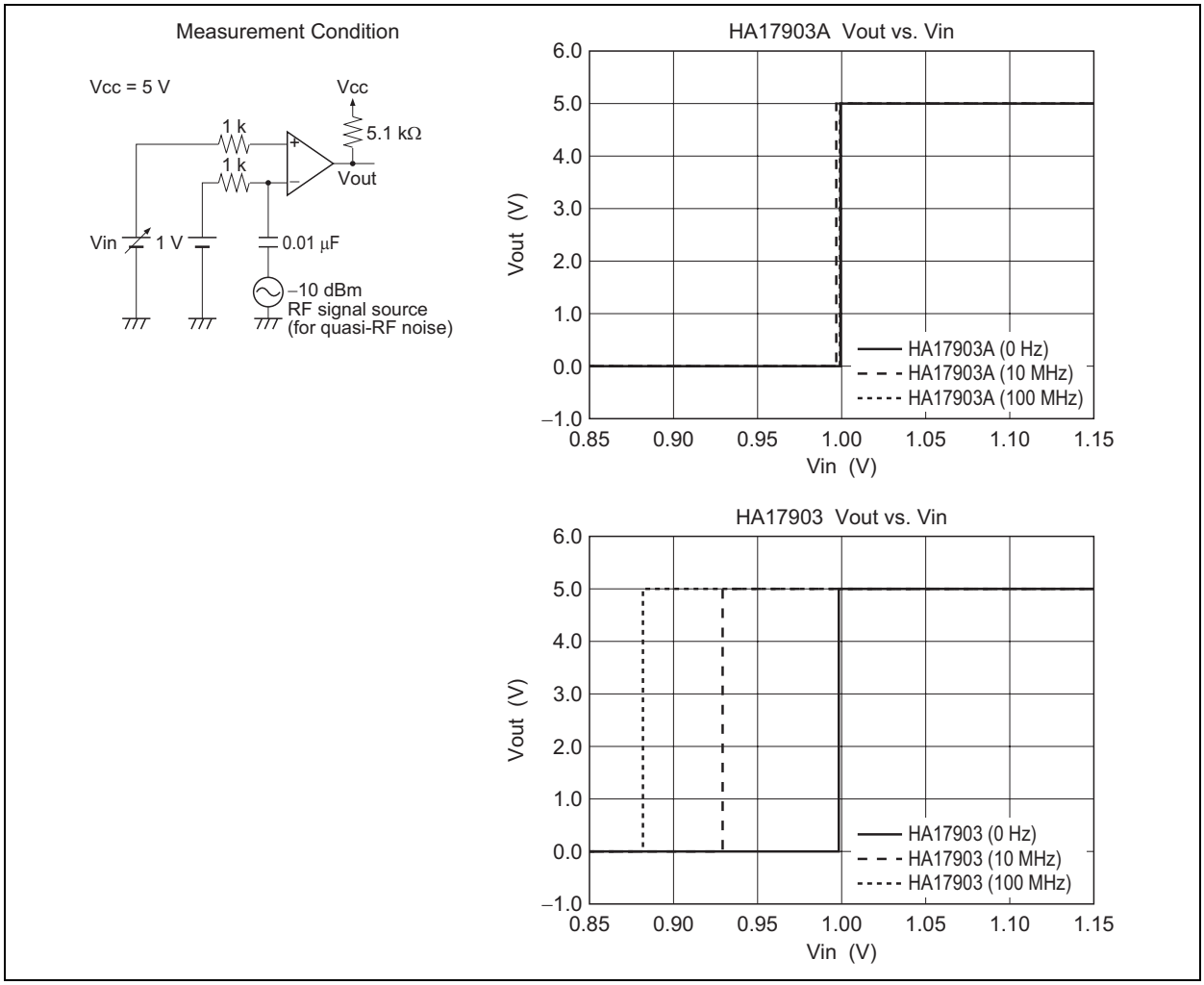
These ICs operate from a single power-supply voltage over a wide range of voltages, and feature a reduced power-supply current since the supply current is independent of the supply voltage.

These comparators have the merit which ground is included in the common-mode input voltage range at a single-voltage power supply operation. These products have a wide range of applications, including limit comparators, simple A/D converters, pulse/square-wave/time delay generators, wide range VCO circuits, MOS clock timers, multivibrators, and high-voltage logic gates.

Features

- Wide power-supply voltage range : 2 to 36 V
- Very low supply current : 0.8 mA Typ.
- Low input bias current : 25 nA Typ.
- Low input offset current : 3 nA Typ.
- Low input offset voltage : 2 mV Typ.
- The common-mode input voltage range includes ground
- Output voltages compatible with CMOS logic systems

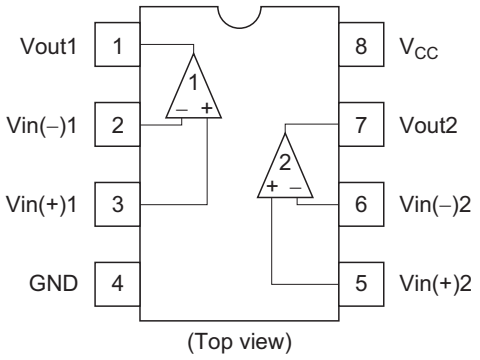
- Low electro-magnetic susceptibility



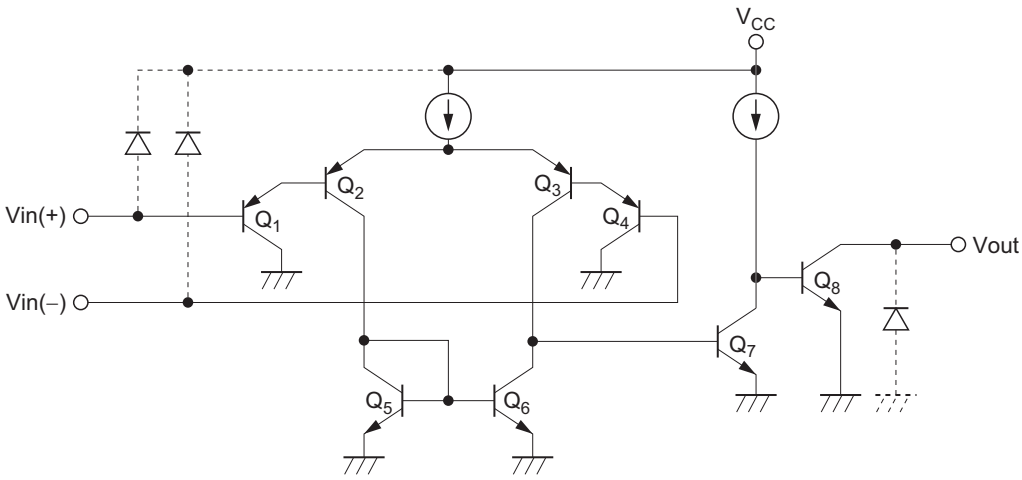
Ordering Information

Type No.	Application	Package Name	Package Code
HA17903APS	Industry use	DIP-8 pin	PRDP0008AF-B
HA17903AFP		SOP-8 pin (JEITA)	PRSP0008DE-B
HA17903ARP		SOP-8 pin (JEDEC)	PRSP0008DD-C
HA17903AT		TSSOP-8 pin	PTSP0008JC-B

Pin Arrangement



Circuit Schematic (1/2)



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}	36	V
Differential input voltage		Vin(diff)	$\pm V_{CC}$	V
Input voltage		Vin	–0.3 to +V_{CC}	V
Output pin voltage		Vout	–0.3 to +36	V
Output short current		Ios *1	constant	
Allowable power dissipation	DIP	P_T	570 *2	mW
	SOP		385 *3	
	TSSOP		192 *4	
Operating temperature		Topr	–40 to +85	°C
Storage temperature		Tstg	–55 to +125	°C

Notes: 1. Short circuit between the output and V_{CC} will be a cause to destory the circuit. The maximum output current is about 20 mA for any supply voltage.
2. HA17903APS:
These are the allowable values up to Ta = 55°C. Derate by 8.3mW/°C above that temperature.
3. HA17903AFP/ARP:
These are the allowable values up to Ta = 25°C mounting in air.
When it is mounted on glass epoxy board of 40 mm × 40 mm × 1.5 mmt with 30% wiring density, the allowable value is 570 mW up to Ta = 45°C. If Ta > 45°C, derate by 7.14 mW/°C.
4. HA17903AT:
These are the allowable values up to Ta = 25°C. Derate by 1.92 mW/°C above that temperature.

Electrical Characteristics

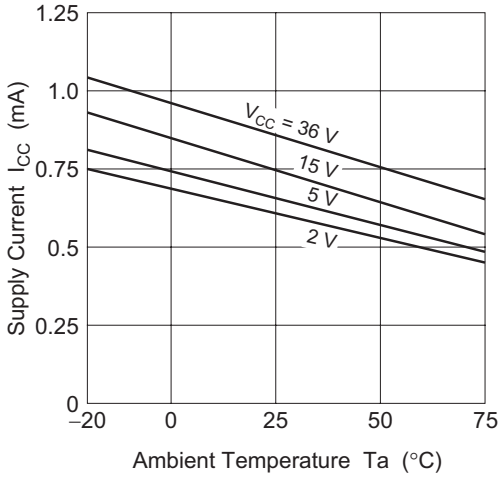
(V_{CC} = 5 V, Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input offset voltage *1	V_{IO}	—	2	5	mV	
Input offset current	I_{IO}	—	3	50	nA	$\lvert I_{IN(+)} - I_{IN(-)} \rvert$
Input bias current *2	I_{IB}	—	25	250	nA	$I_{IN(+)}$ or $I_{IN(-)}$
Common mode input voltage *3	V_{CM}^+	3.5	—	—	V	
	V_{CM}^-	—	—	0	V	
Supply current	I_{CC}	—	0.8	2.0	mA	All comparators: R_L = ∞, All channels on
Voltage gain *5	A_{VD}	—	(200)	—	V/mV	V_{CC} = 15V, R_L ≥ 15kΩ
Response time *4,5	t_R	—	(1.3)	—	µs	V_{RL} = 5V, R_L = 5.1kΩ
Large signal response time *5	t_{RI}	—	(300)	—	ns	V_{IN} = TTL Threshold width, V_{REF} = 1.4V
Output sink current	$I_{O(sink)}$	6	16	—	mA	$V_{IN(-)}$ ≥ 1V, $V_{IN(+)}$ = 0, V_O ≤ 1.5V
Output saturation voltage	$V_{O(sat)}$	—	—	400	mV	$V_{IN(-)}$ ≥ 1V, $V_{IN(+)}$ = 0, Iosink = 4mA
Output leak current *5	I_{LO}	—	(0.1)	—	nA	$V_{IN(-)}$ = 0, $V_{IN(+)}$ ≥ 1V, V_O = 5V

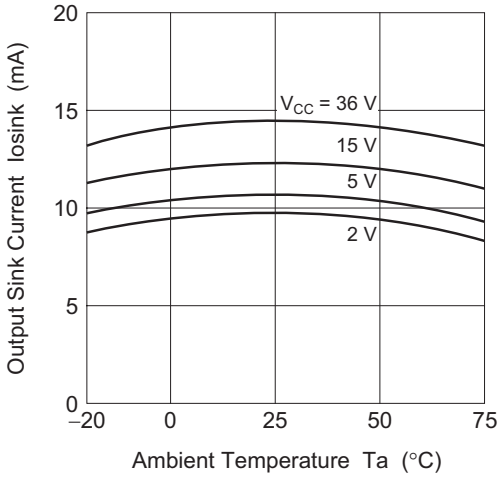
Notes: 1. V_{REF} = 1.4 V and R_S = 50 Ω, when V_O = 1.4 V at output switching point.
2. Under linear operation.
3. Common mode input voltage or each one of the input signal should not be less than –0.3 V.
4. This is a value to 100 mV input step voltage with 5 mV over drive.
5. Design spec.

Characteristic Curves

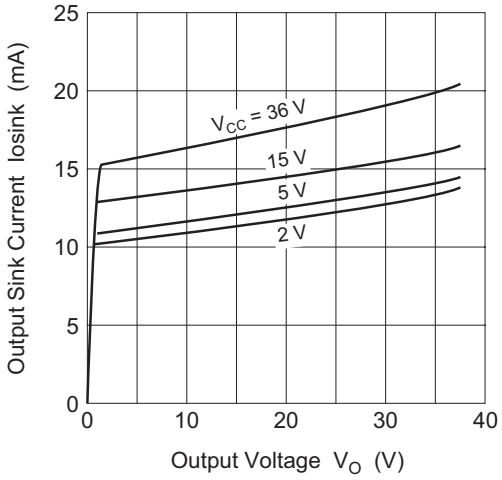
Supply Current vs. Ambient Temperature



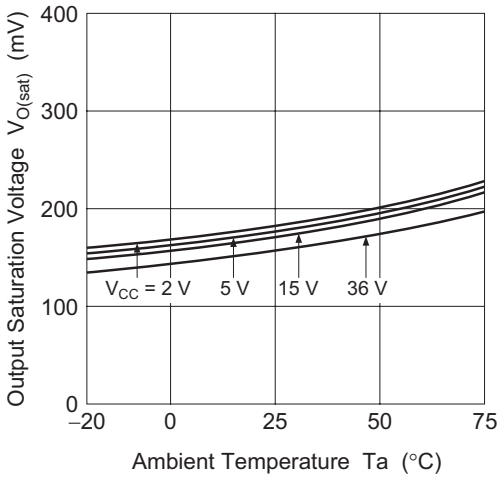
Output Sink Current vs. Ambient Temperature



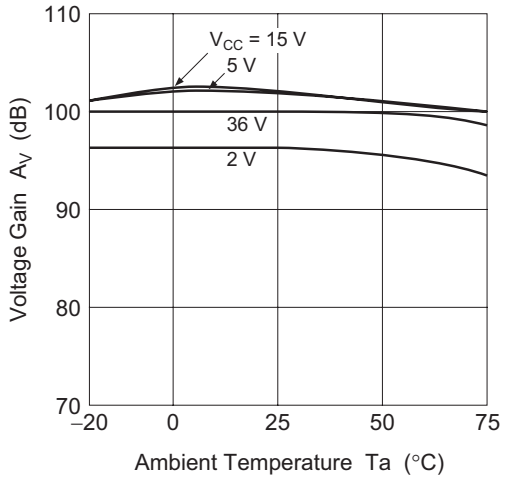
Output Sink Current vs. Output Voltage



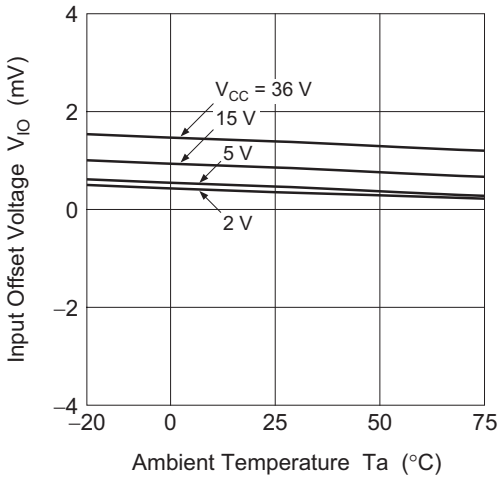
Output Saturation Voltage vs. Ambient Temperature



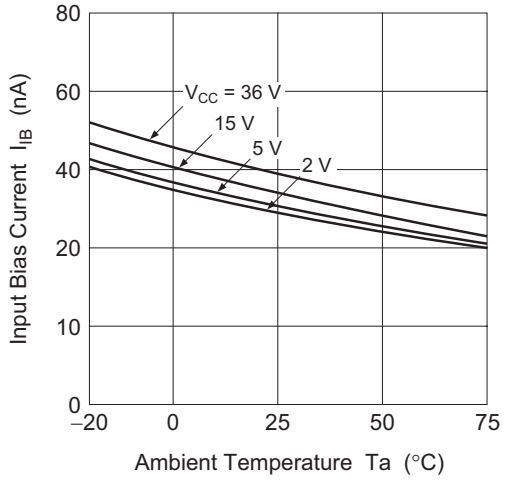
Voltage Gain vs. Ambient Temperature



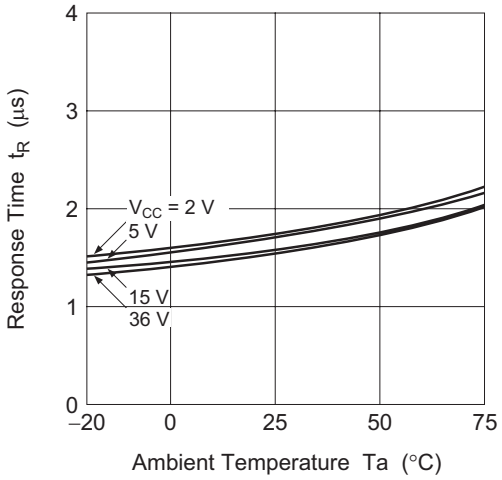
Input Offset Voltage vs. Ambient Temperature



Input Bias Current vs. Ambient Temperature

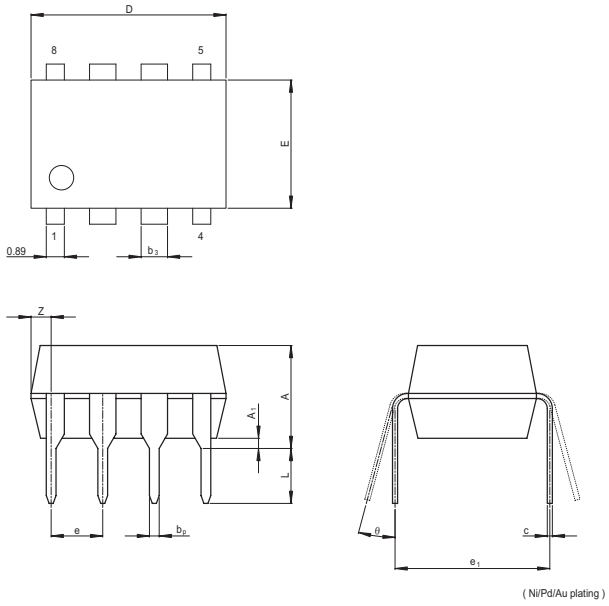


Response Time vs. Ambient Temperature



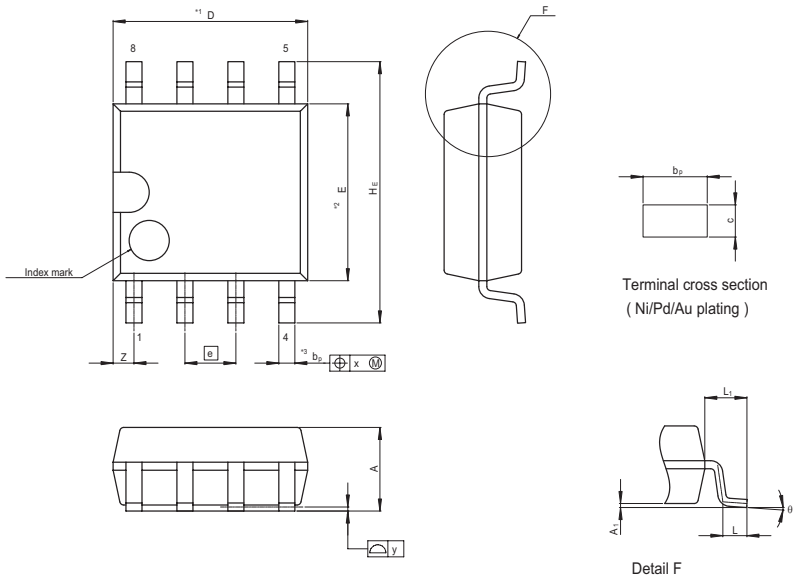
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP8-6.3x9.6-2.54	PRDP0008AF-B	DP-8FV	0.54g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e_1	—	7.62	—
D	—	9.60	10.6
E	—	6.30	7.4
A	—	—	5.06
A_1	0.5	—	—
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	—	—	1.27
L	2.54	—	—

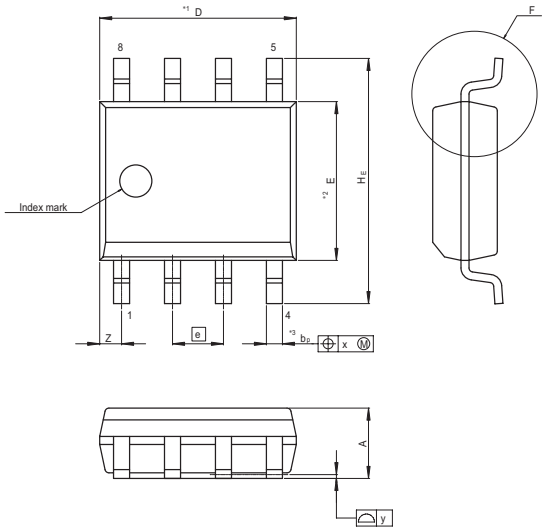
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-4.4x4.85-1.27	PRSP0008DE-B	FP-8DGV	0.1g

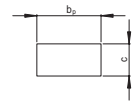


NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

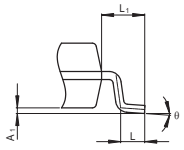
Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	4.85	5.25
E	—	4.4	—
A_2	—	—	—
A_1	0.00	0.1	0.20
A	—	—	2.03
b_p	0.35	0.4	0.45
b_1	—	—	—
c	0.15	0.20	0.25
c_1	—	—	—
θ	0°	—	8°
H_E	6.35	6.5	6.75
e	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.75
L	0.42	0.60	0.85
L_1	—	1.05	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-3.95x4.9-1.27	PRSP0008DD-C	FP-8DCV	0.085g





Terminal cross section
(Ni/Pd/Au plating)

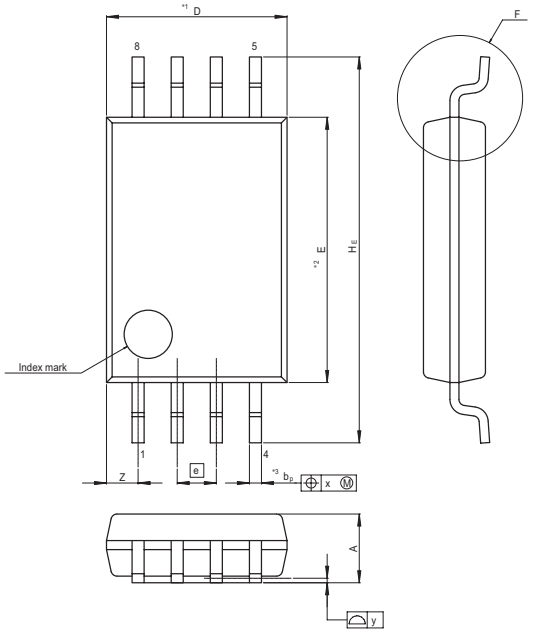


Detail F

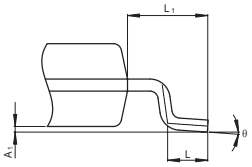
NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	4.90	5.30
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
e	—	1.27	—
x	—	—	0.25
y	—	—	0.10
Z	—	—	0.75
L	0.40	0.60	1.27
L_1	—	1.08	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-TSSOP8-4.4x3-0.65	PTSP0008JC-B	TTP-8DAV	0.034g



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 OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	3.00	3.30
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
e	—	0.65	—
x	—	—	0.13
y	—	—	0.10
Z	—	—	0.805
L	0.40	0.50	0.60
L_1	—	1.00	—

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Colophon .6.0