READ2304G

High Drivability & High Slew Rate, Input Output Full Range, CMOS Dual Operational Amplifier

R03DS0159EJ0100
Rev.1.00
2020.08.20

V_{IO}≤±6mV, SR = 8V/μs , GBW=6MHz

Description

The READ2304G is input and output full range dual CMOS Operational Amplifier realizing high drivability and high slew rate. This IC can be used in minimum operating supply voltage from 2.5V, and in wide ambient temperature range from -40˚C to +105˚C.

Available in ultra-small 8 pins TSSOP and MSOP packages.

Features

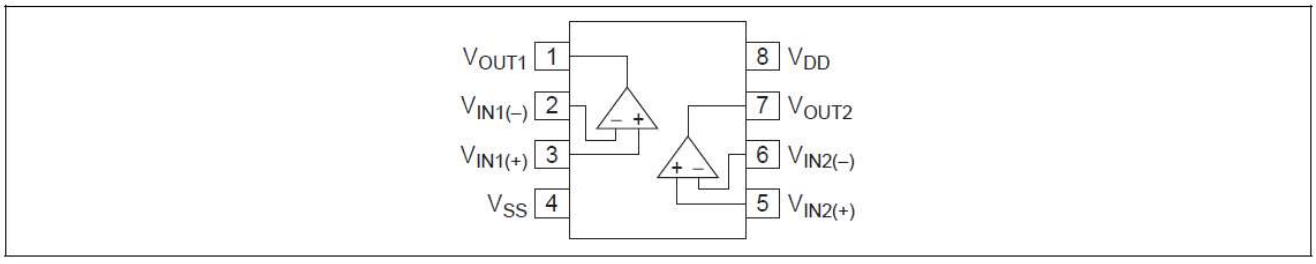
- Low voltage single supply operation — V_{DD} = 2.5V to 5.5V
- Low input offset voltage — V_{IO} ≤ ±6.0mV
- Low input bias current — I_B ≤ (1pA).
- Wide output voltage range — V_{OUT} : V_{SS}+0.1V to V_{DD}-0.1V(@Io=5mA)
- Supply current (per channel) — I_{DD} = 0.75mA Typ.
- High slew rate — SR = 8V/μs Typ.

( ) reference value of design

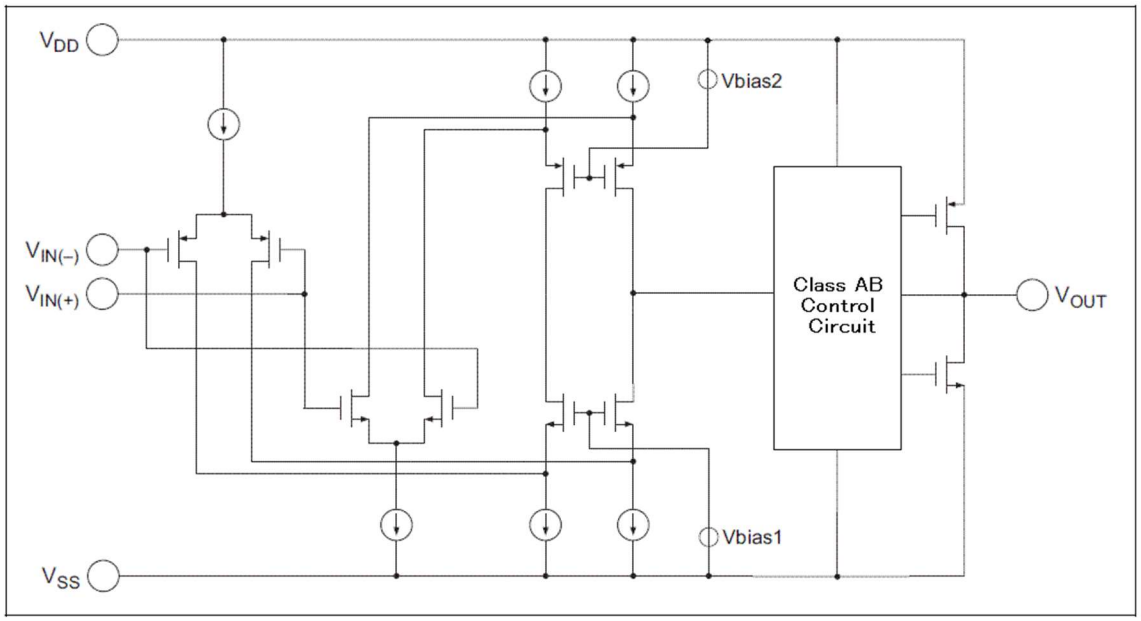
Product Line-up

Type name	Product type quality level	Package
READ2304GSP	High slew rate with Normal quality level	8 pins plastic TSSOP
READ2304GSN	High slew rate with Normal quality level	8 pins plastic MSOP

Pin Arrangement



Equivalent Circuit (per one channel)



Absolute Maximum Ratings

<TA=25˚C>

Items	Symbol	Ratings	Unit
Supply voltage Note.1	V_{DD}	-0.3 to +6.5	V
Differential input voltage	V_{ID}	$-V_{DD}$ to $+V_{DD}$	V
Input voltage Note.2	V_I	-0.3 to V_{DD} +0.3	V
Maximum output current	I_O	20	mA
Power dissipation Note.3	P_T	440	mW
Junction temperature	T_j	+150	˚C
Operating temp. range	T_A	-40 to +105	˚C
Storage temp. range	T_{stg}	-55 to +150	˚C

Note 1. Please take note that reverse connection of a power supply may cause destruction.

2. Stresses above these ratings may cause permanent damage such as characteristics degradation or destruction. Please do not exceed voltage below of GND-0.3V as it is bottom limit. In addition, operation amplifier is operated as normal when input voltage for electrical characteristics is in common mode input voltage range.

3. The value is measured under mounted on a glass epoxy base board (size 100mm x 100mm, 1mm thickness, copper foiled surface base board area with 15% solid pattern).

Note that restrictions will be made to the following conditions for each product, and the derating ratio depending on the operating ambient temperature.

READ2304GSP: Derate at -5.5 mW/˚C when T_A > 69 ˚C

(Junction – ambient thermal resistance $R_{th(J-A)}$ = 183 ˚C/W)

READ2304GSN: Derate at -4.8 mW/˚C when T_A > 58 ˚C

(Junction – ambient thermal resistance $R_{th(J-A)}$ = 208 ˚C/W)

Electrical Characteristics

<V_{DD}=5V, T_A= +25˚C>

Items	Symbol	MIN.	TYP.	MAX.	Unit	Test Condition
Supply voltage	V_{DD} − V_{SS}	2.5		5.5	V	
Input offset voltage	V_{IO}			±6.0	mV	
Input offset current	I_{IO}			(1)	pA	
Input bias current	I_B			(1)	pA	
Output high voltage	V_{OH}	V_{DD}-0.2			V	I_L = 10mA
Output low voltage	V_{OL}			V_{SS}+0.2	V	I_L = 10mA
Voltage gain	A_V	60	90		dB	R_L≥100kΩ
Channel supply current	I_{DD}/ch		0.75	1.5	mA	R_L=∞, I_O=0
Common mode rejection ratio	CMRR	60	80		dB	
Supply voltage rejection ratio	SVRR	60	80		dB	
Common mode input voltage range	V_{ICM}	V_{SS}		V_{DD}	V	
Gain bandwidth product	GBW		6		MHz	C_L=20pF
Slew rate	SR		8		V/us	C_L=20pF

( ) reference value of design

Notes

Output terminal: The over-current protection feature is not built in the output terminal of this product.

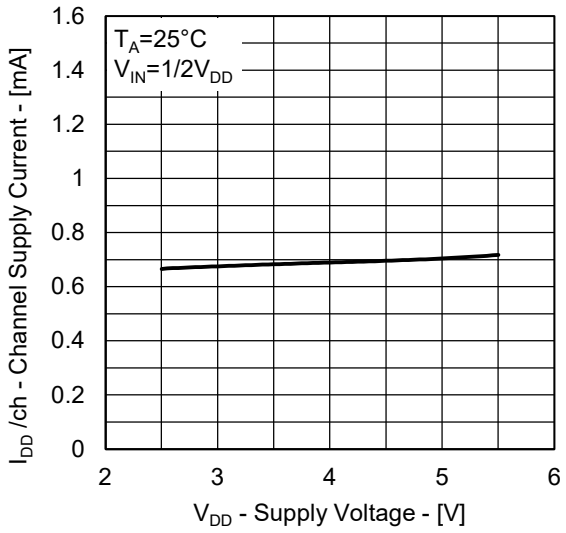
Therefore, please insert resistance to output port.

Input offset voltage : The amplifier circuit of the first block of operational amplifier.

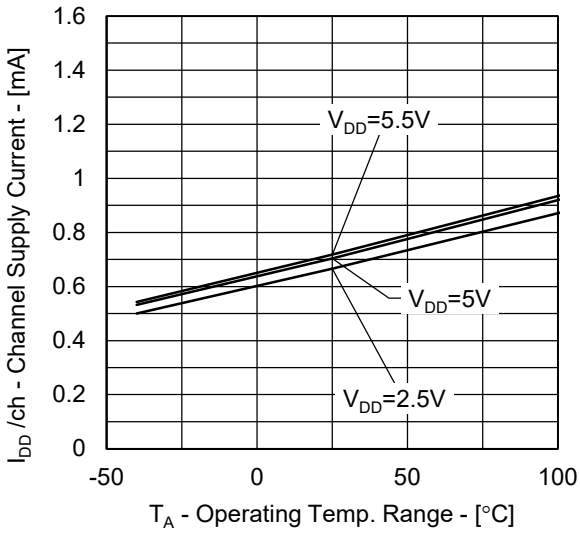
A circuit suitable for operation near GND, and a circuit suitable for operation near +power supply. In case of input voltage of overlap point output port has a minute voltage shift or distortion.

Electrical Characteristics

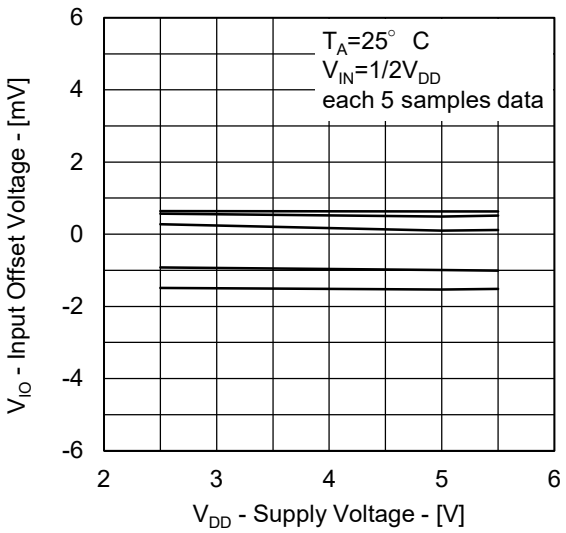
I_{DD} /ch vs. V_{DD}



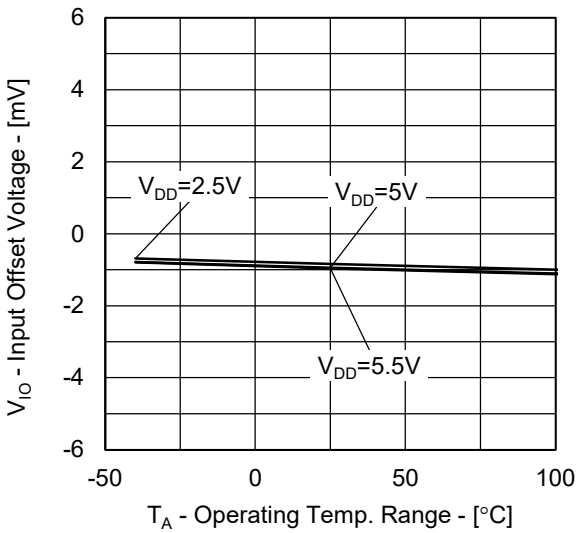
I_{DD} /ch vs. T_A



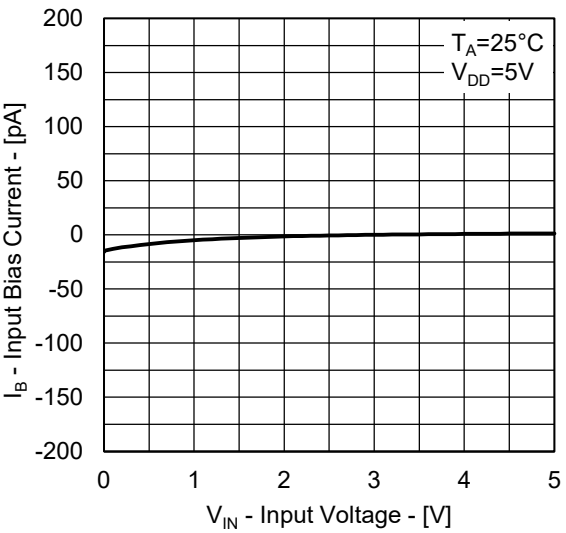
V_{IO} vs. V_{DD}



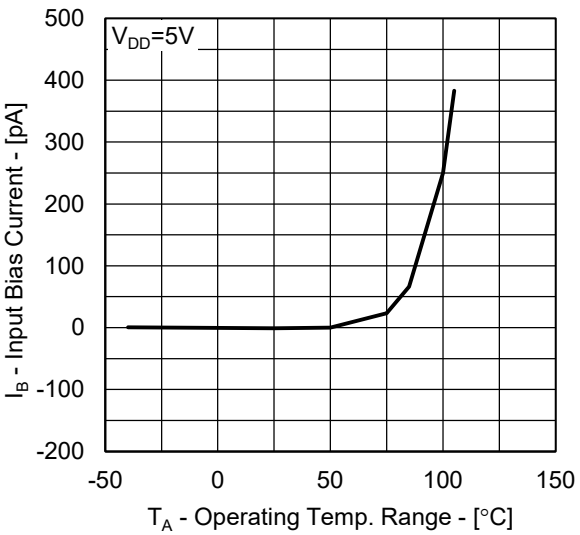
V_{IO} vs. T_A



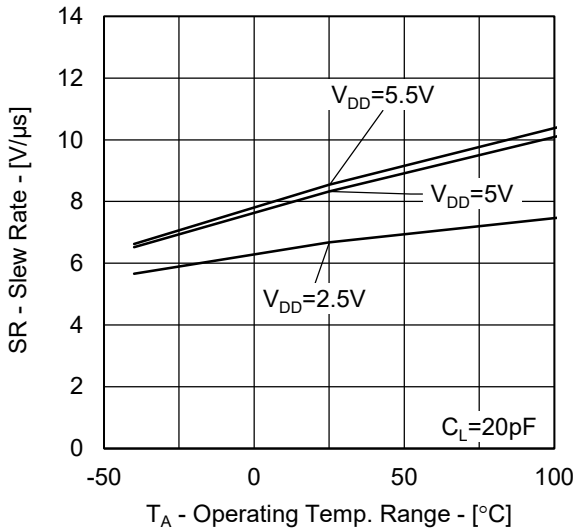
I_B vs. V_{IN}



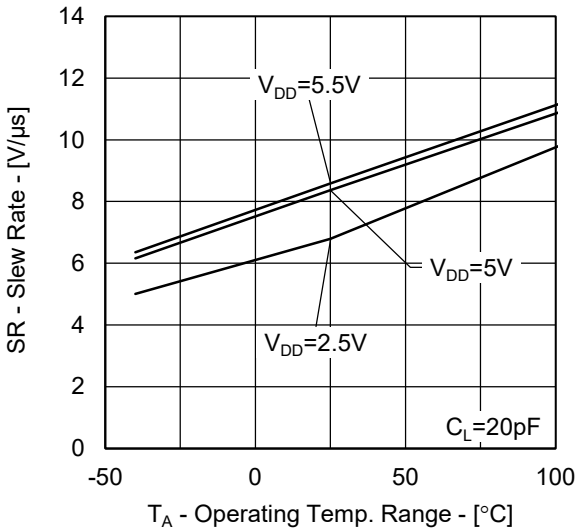
I_B vs. T_A



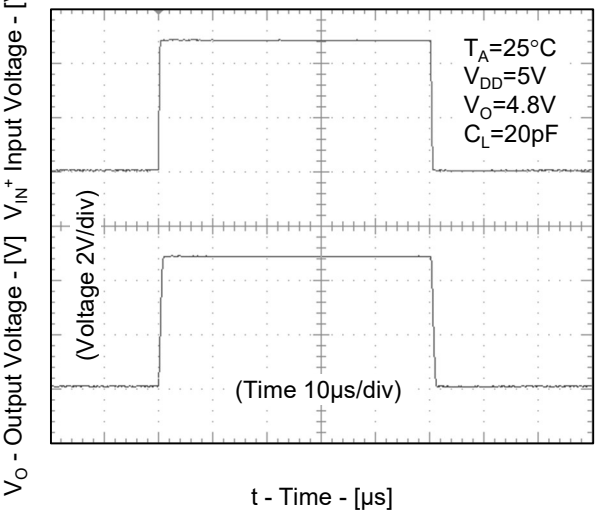
SR vs. T_A (Output Rise Time)



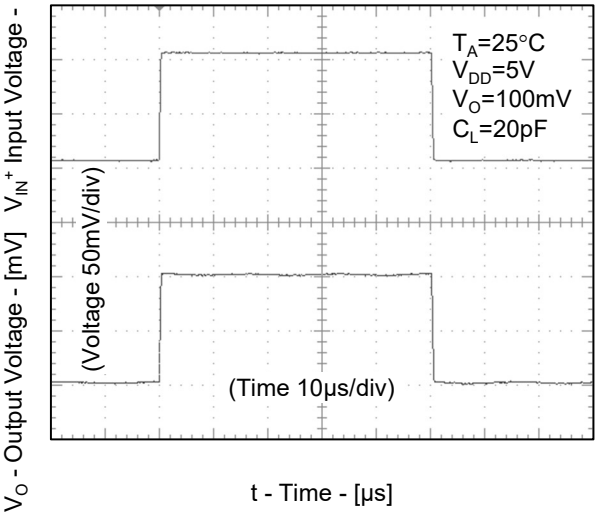
SR vs. T_A (Output Fall Time)



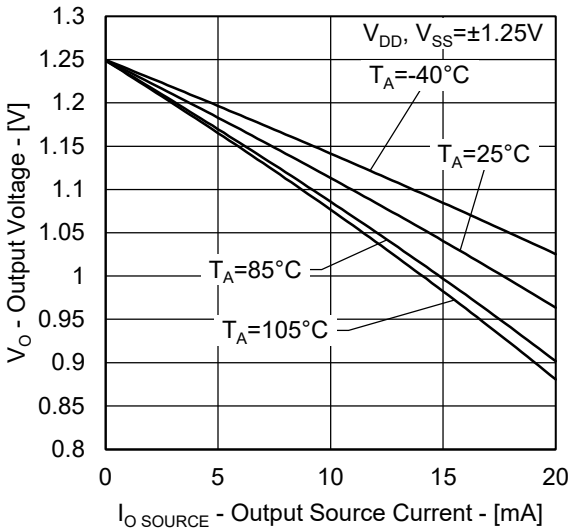
Pulse Response



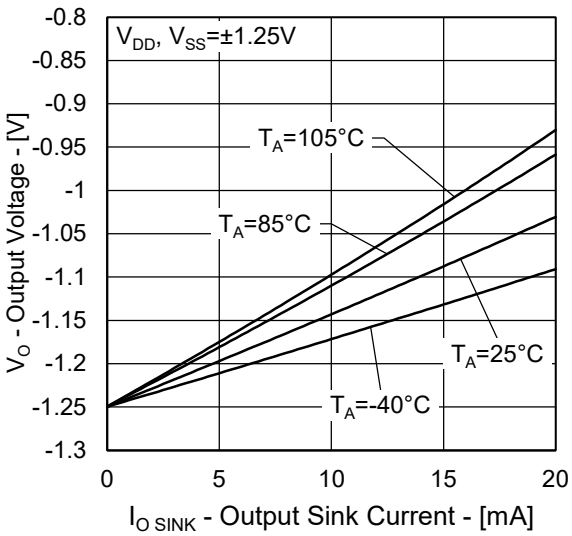
Pulse Response



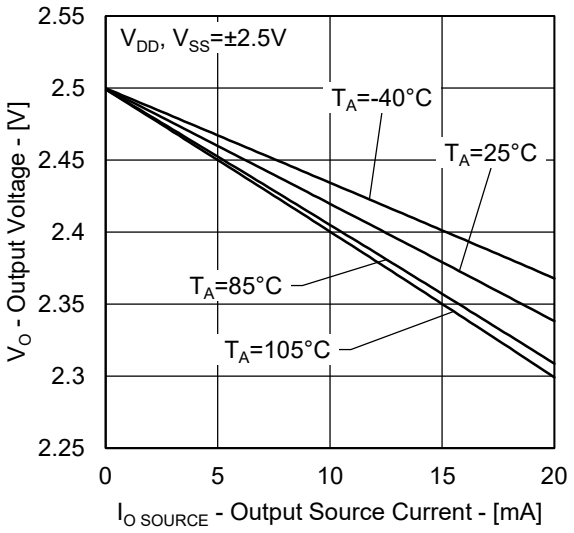
V_O vs. $I_{O\ SOURCE}$



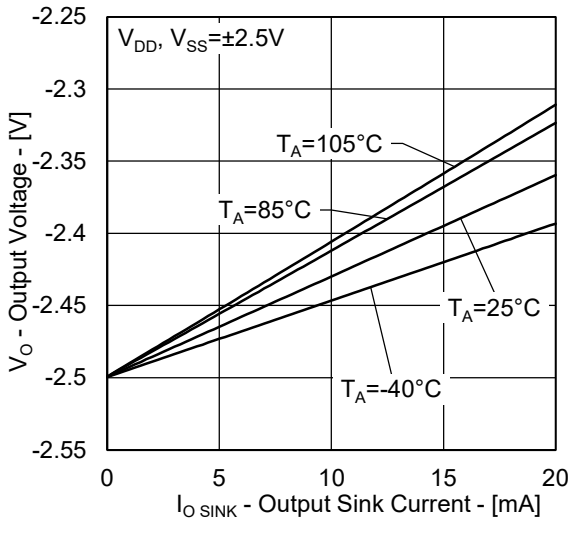
V_O vs. $I_{O\ SINK}$



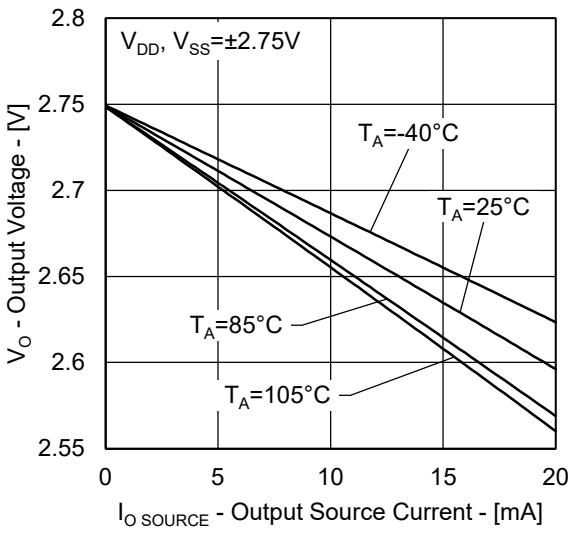
V_O vs. $I_{O\ SOURCE}$



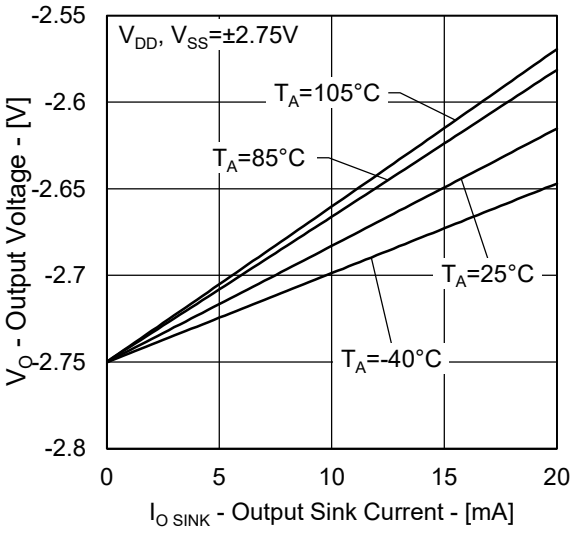
V_O vs. $I_{O\ SINK}$



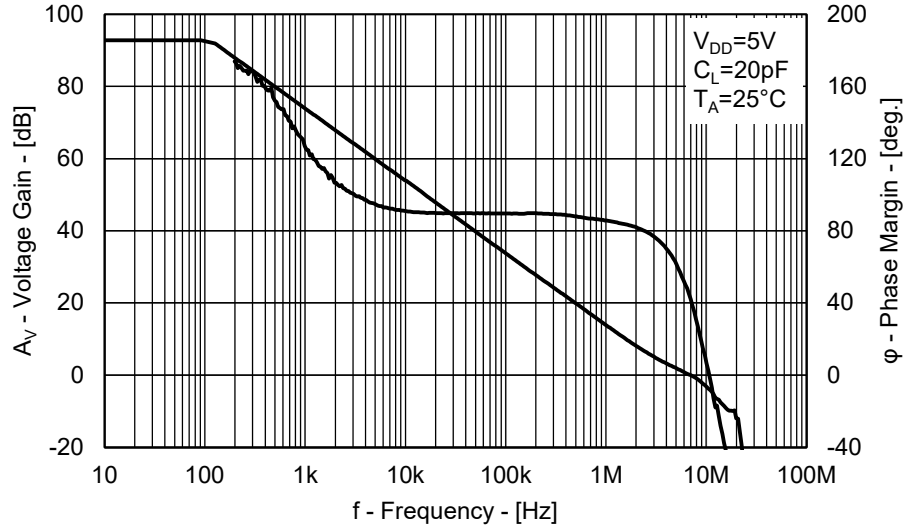
V_O vs. $I_{O\ SOURCE}$



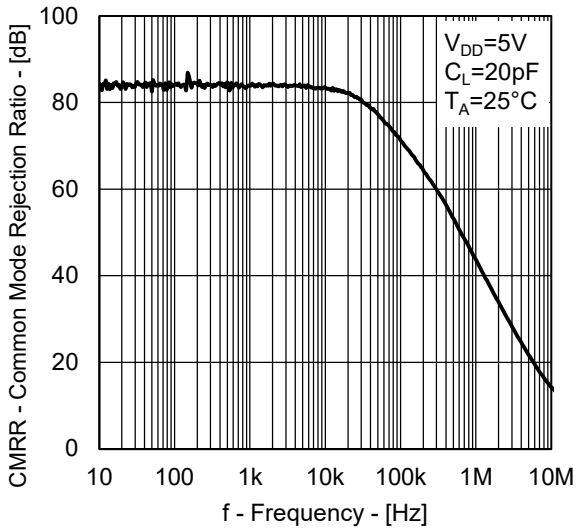
V_O vs. $I_{O\ SINK}$



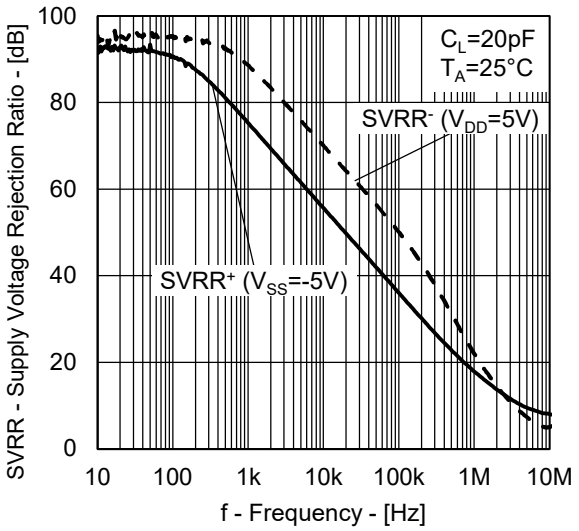
A_V, φ vs. f



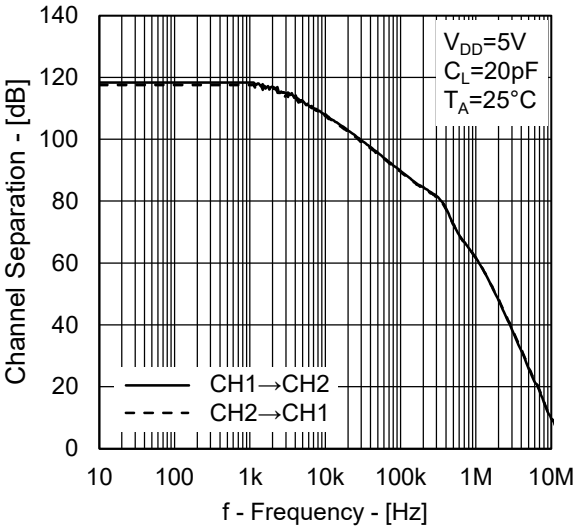
CMRR vs. f



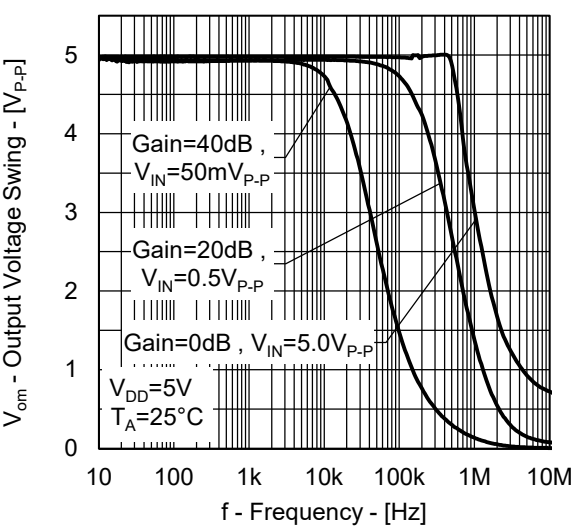
SVRR vs. f



Channel Separation vs. f



V_{om} vs. f

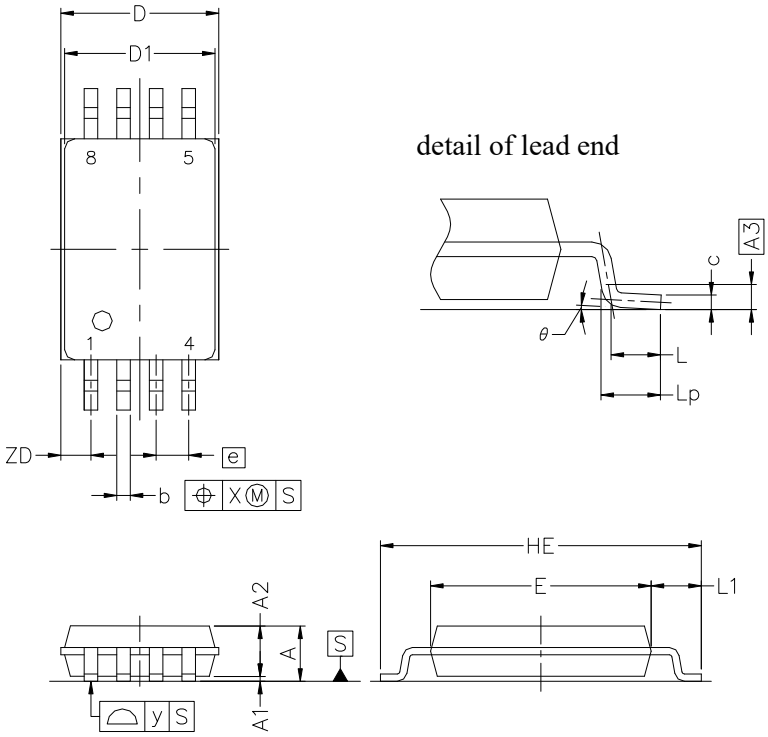


Package Dimensions

8-PIN PLASTIC TSSOP

JEITA Package code	RENESAS code	Previous code	MASS(TYP.)[g]
P-TSSOP8-0225-0.65	PTSP0008JD-A	P8GR-65-9LG	—

Unit:mm



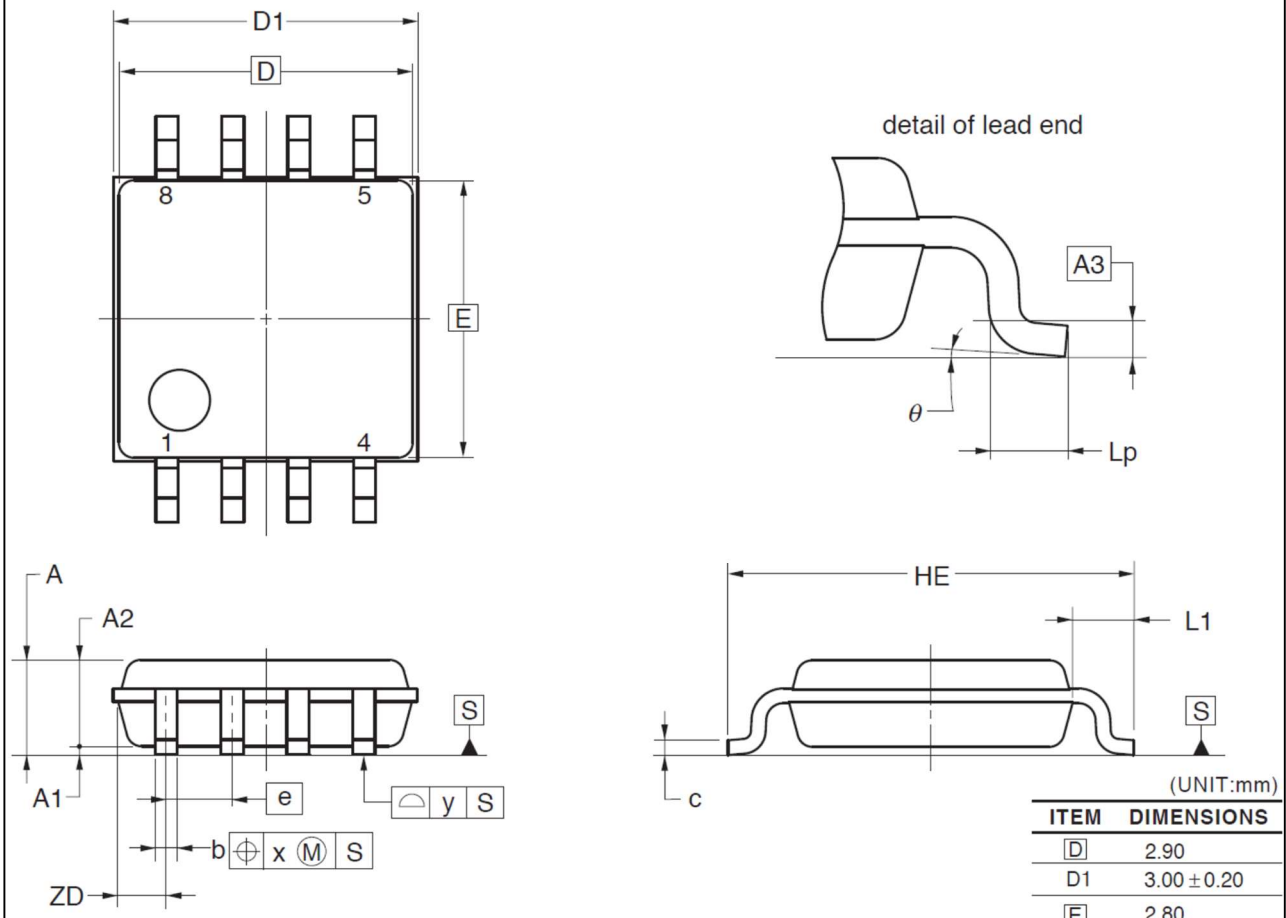
ITEM	MILLIMETERS
D	3.15 ±0.15
D1	3.00 ±0.10
E	4.40 ±0.10
HE	6.40 ±0.20
A	1.20 MAX.
A1	0.10 ±0.05
A2	1.00 ±0.05
[A3]	0.25
b	0.24 +0.06 -0.05
c	0.145 ±0.055
L	0.5
Lp	0.60 ±0.15
L1	1.00 ±0.20
θ	3° +5° -3°
[e]	0.65
x	0.10
y	0.10
ZD	0.60

NOTE

Each lead centerline is located within 0.10 mm of its true position at maximum material condition.

8-PIN PLASTIC MSOP

JEITA Package Code	RENESAS Code	Previous Code	MASS (TYP.) [g]
P-TSSOP8-2.8x2.9-0.65	PTSP0008JF-A	P8MP-65-KAA-1	0.02



(UNIT:mm)

ITEM	DIMENSIONS
D	2.90
D1	3.00 ±0.20
E	2.80
HE	4.00 ±0.20
e	0.65
b	0.22 ±0.05
A	1.03 MAX.
A1	0.08 ±0.05
A2	0.85 ±0.05
A3	0.25
L1	0.60 ±0.20
c	$0.145^{+0.05}_{-0.03}$
Lp	0.37 ±0.10
x	0.10
y	0.10
θ	$3^{\circ}{}^{+5^{\circ}}_{-3^{\circ}}$
ZD	0.525

NOTE

Each lead centerline is located within 0.10 mm of its true position at maximum material condition.

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7. 虽然瑞萨电子一直致力于提高瑞萨电子产品的质量和可靠性，但是，半导体产品有其自身的具体特性，如一定的故障发生率以及在某些使用条件下会发生故障等。除非是瑞萨电子数据表或其他瑞萨电子文档中指定为高可靠性产品或用于恶劣环境的产品，否则瑞萨电子产品未进行防辐射设计。用户负责执行安全保护措施，以避免因瑞萨电子产品失效或发生故障而造成身体伤害、火灾导致伤害或损害和/或其他对公众构成危险的事故。例如进行软硬件安全设计（包括但不限于冗余设计、防火控制以及故障预防等）、适当的老化处理或其他适当的措施等。由于对微机软件单独进行评估非常困难且不实际，所以请用户自行负责对最终产品或系统进行安全评估。
8. 关于环境保护方面的详细内容，例如每种瑞萨电子产品的环境兼容性等，请与瑞萨电子的营业部门联系。用户负责仔细并充分查阅对管制物质的使用或含量进行管理的所有适用法律法规（包括但不限于《欧盟RoHS指令》），并在使用瑞萨电子产品时遵守所有适用法律法规。对于因用户未遵守相应法律法规而导致的损害或损失，瑞萨电子概不承担任何责任。
9. 不可将瑞萨电子产品和技术用于或者嵌入日本国内或海外相应的法律法规所禁止生产、使用及销售的任何产品或系统中。也不可将瑞萨电子产品或技术用于(1)与大规模杀伤性武器（例如核武器、化学武器、生物武器或运送此等武器的导弹，包括无人机(UAV)）的开发、设计、制造、使用、存储等相关的任何目的；(2)与常规武器的开发、设计、制造或使用相关的任何目的；(3)扰乱国际和平与安全的任何其他目的，并且不可向任何第三方销售、出口、租赁、转让、或让与瑞萨电子产品或技术，无论直接或间接知悉或者有理由知悉该第三方或任何其他方将从事上述活动。用户必须遵守对各方或交易行使司法管辖权的任意国家/地区政府所公布和管理的任何适用出口管制法律法规。
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（注1） 瑞萨电子：在本文档中指瑞萨电子株式会社及其控股子公司。
（注2） 瑞萨电子产品：指瑞萨电子开发或生产的任何产品。

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