μPC358MF-DAA

Bipolar Analog Integrated Circuit

R03DS0005EJ0100
Rev.1.00
Aug 04, 2010

Description

The μPC358MF-DAA is dual operational amplifier which is designed to operate for a single power supply. It includes features of low-voltage operation, a common-mode input voltage that range from V^- (GND) level, an output from a V^- (GND) level that is determined by the output stage of class C push-pull circuit and a 50 μA (TYP.) constant current, and a low current consumption. In addition, this can operate at both positive and negative power supply and it can be extensively used in various amplifier circuits.

This package becomes smaller than μPC358G2 package in existence because the package adopts the narrow body SOP that is generally used abroad.

Features

- The package is compliant with a JEDEC standard (MS-012).
- Thermal resistance was improved more than 30% from existing μPC358G2 by adopting copper-based lead material. ($R_{th(j-a)}$ = 156°C/W)
- Wider Operating Ambient Temperature range than μPC358G2
  — μPC358MF-DAA (T_A = –40 to +85°C), μPC358G2 (T_A = –20 to +80°C)
- Input Offset Voltage ±2 mV (TYP.)
- Input Bias Current 14 nA (TYP.)
- Internal frequency compensation
- Output short-circuit protection
- Large Signal Voltage Gain 100000 (TYP.)

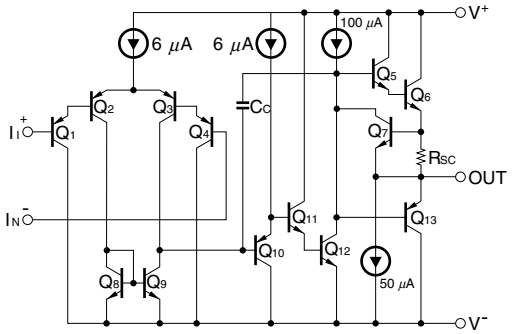
Ordering Information

Part No.	Package	Package Type
μPC358MF-DAA-E1-AT[*1]	8-pin plastic SOP (3.9 × 4.9)	• 12 mm wide embossed taping • Pin 1 on draw-out side • 2500 p/reel
μPC358MF-DAA-E2-AT[*1]	8-pin plastic SOP (3.9 × 4.9)	• 12 mm wide embossed taping • Pin 1 at take-up side • 2500 p/reel

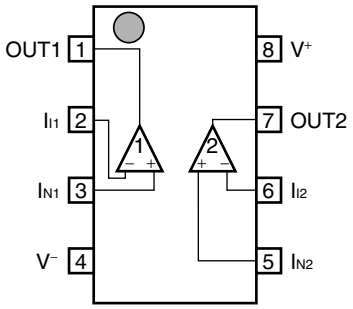
Note: [*]1.Pb-free (This product does not contain Pb in the external electrode and other parts.)

CAUTION	Do not use the products in applications such as the transportation equipment (a car, a train, a ship, etc.) where "Special quality grade" is required, because the products are placed in a quality grade "standard" to be required at general devices.

Equivalent Circuit (1/2 Circuit)



Pin Configuration (Marking side)



Absolute Maximum Ratings (T_A = 25°C)

Parameter	Symbol	Ratings	Unit
Voltage between V^+ and V^- *1	$V^+ - V^-$	−0.3 to +32	V
Differential Input Voltage	V_{ID}	±32	V
Input Voltage *2	V_I	V^- − 0.3 to V^- + 32	V
Output Applied Voltage *3	V_O	V^- − 0.3 to V^+ + 0.3	V
Total Power Dissipation *4	P_T	440	mW
Output Short Circuit Duration (vs. GND) *5	t_S	Indefinite	s
Operating Ambient Temperature	T_A	−40 to +85	°C
Storage Temperature	T_{stg}	−55 to +125	°C

Notes: *1.Note that reverse connections of the power supply may damage ICs.

*2.The input voltage is allowed to input without damage or destruction independent of the magnitude of V^+. Either input signal is not allowed to go negative by more than 0.3 V. In addition, the input voltage that operates normally as an operational amplifier is within the Common Mode Input Voltage range of an electrical characteristic.

*3.A range where input voltage can be applied to an output pin externally with no deterioration or damage to the feature (characteristic). The input voltage can be applied regardless of the electric supply voltage. This specification which includes the transition state such as electric power ON/OFF must be kept.

*4.This is the value in $T_A \leq 56$°C of when the glass epoxy substrate (size: 100 mm x 100 mm, thickness: 1 mm, 15% of the substrate area where only one side is copper foiled is filling wired) is mounted. Derate at −6.4 mW/°C when T_A > 56°C. In the condition same as the above, Junction − ambient thermal resistance $R_{th(J-A)}$ = 156°C/W.

*5.Only as for $V^+ \leq$ 15V and any 1 channel. Please use the product within the derating condition or Total Power Dissipation, which are showed in Note 4.

Recommended Operating Conditions

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Power Supply Voltage (Split)	$V^{\pm}$	±1.5		±15	V
Power Supply Voltage (V^- = GND)	V^+	+3		+30	V

Electrical Characteristics (T_A = 25°C, V^+ = +5 V, V^- = GND)

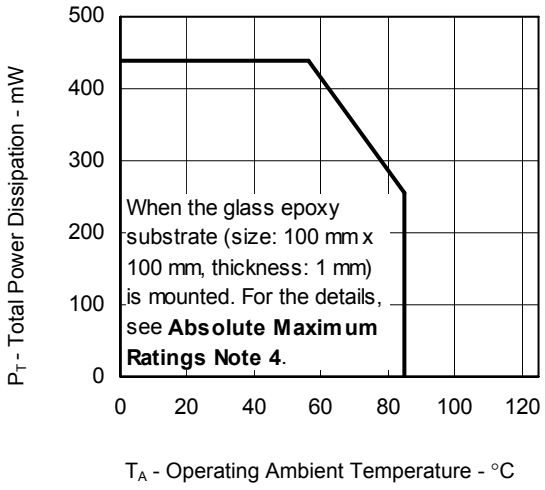
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V_{IO}	R_S = 0 Ω		±2	±7	mV
Input Offset Current	I_{IO}			±5	±50	nA
Input Bias Current *1	I_B			14	250	nA
Large Signal Voltage Gain	A_V	$R_L \geq 2$ kΩ	25000	100000		
Circuit Current *2	I_{CC}	R_L = ∞, I_O = 0 A		0.7	1.2	mA
Common Mode Rejection Ratio	CMR		65	70		dB
Supply Voltage Rejection Ratio	SVR		65	100		dB
Output Voltage Swing	V_O	R_L = 2 kΩ (Connect to GND)	0		V^+−1.5	V
Common Mode Input Voltage Range	V_{ICM}		0		V^+−1.5	V
Output Source Current	$I_{O\ SOURCE}$	$V_{IN\ (+)}$ = +1V, $V_{IN\ (-)}$ = 0 V	20	40		mA
Output Sink Current	$I_{O\ SINK1}$	$V_{IN\ (-)}$ = +1 V, $V_{IN\ (+)}$ = 0 V	10	20		mA
	$I_{O\ SINK2}$	$V_{IN\ (-)}$ = +1 V, $V_{IN\ (+)}$ = 0 V, V_O = 200 mV	12	50		μA
Channel Separation		f = 1 to 20 kHz		120		dB

Notes: *1.The input bias current flows in the direction where the IC flows out because the first stage is configured with a PNP transistor.

*2.This is a current that flows in the internal circuit. This current will flow irrespective of the channel used.

Typical Performance Characteristics (T_A = 25°C, TYP.) (Reference value)

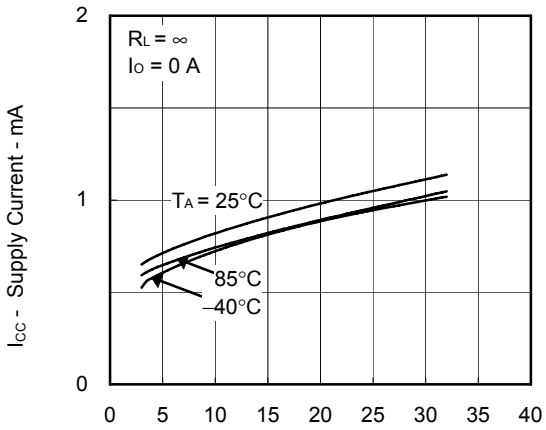
P_T vs. T_A



P_T - Total Power Dissipation - mW

T_A - Operating Ambient Temperature - °C

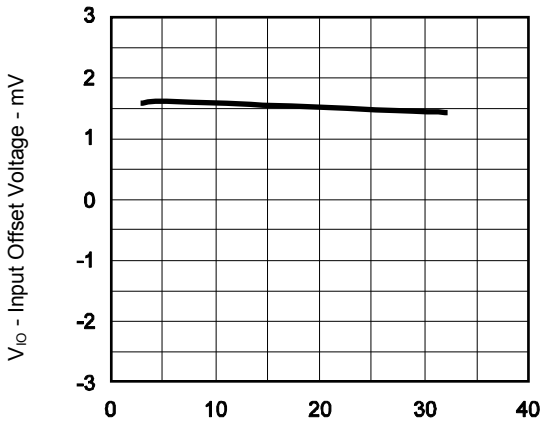
I_{CC} vs. V^+



I_{CC} - Supply Current - mA

V^+ - Power Supply Voltage - V (V^- = GND)

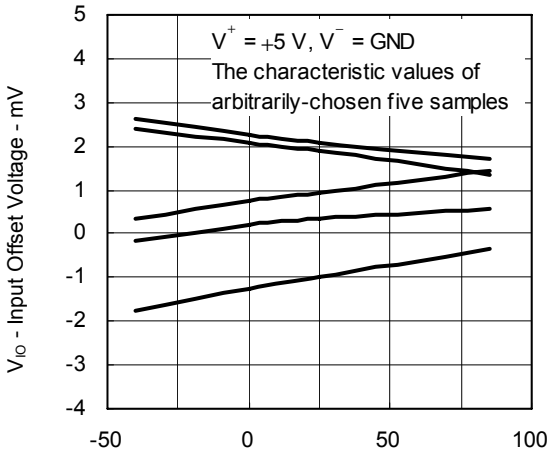
V_{IO} vs. V^+



V_{IO} - Input Offset Voltage - mV

V^+ - Power Supply Voltage - V (V^- = GND)

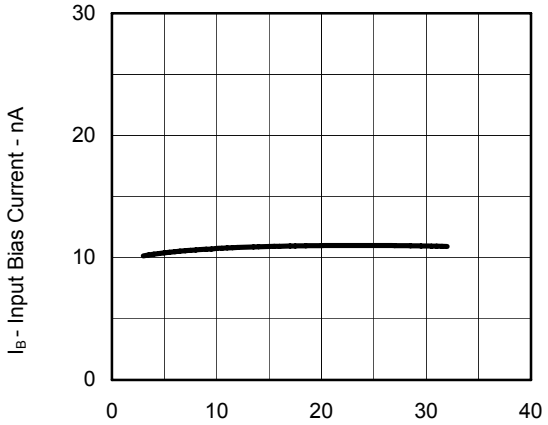
V_{IO} vs. T_A



V_{IO} - Input Offset Voltage - mV

T_A - Operating Ambient Temperature - °C

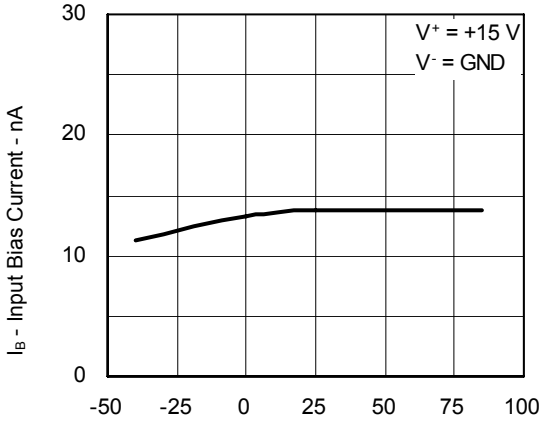
I_B vs. V^+



I_B - Input Bias Current - nA

V^+ - Power Supply Voltage - V (V^- = GND)

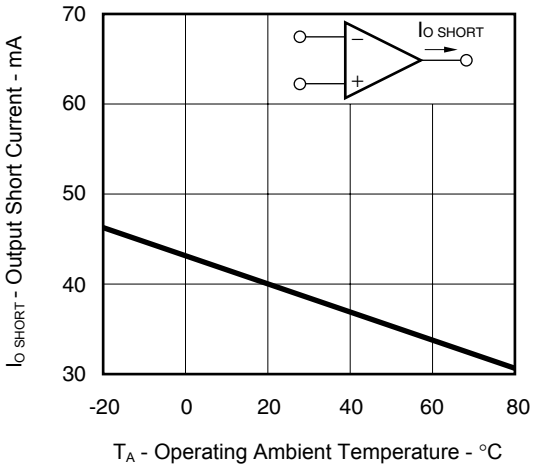
I_B vs. T_A



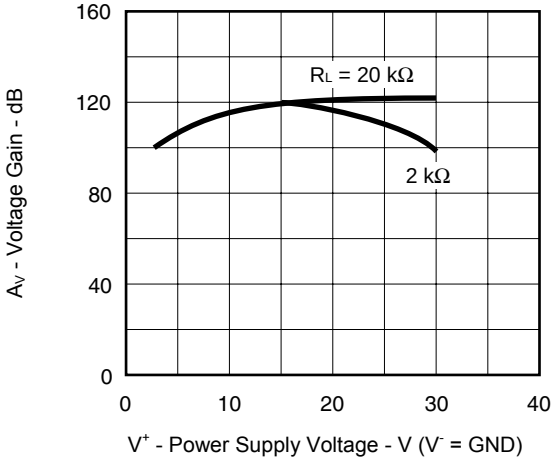
I_B - Input Bias Current - nA

T_A - Operating Ambient Temperature - °C

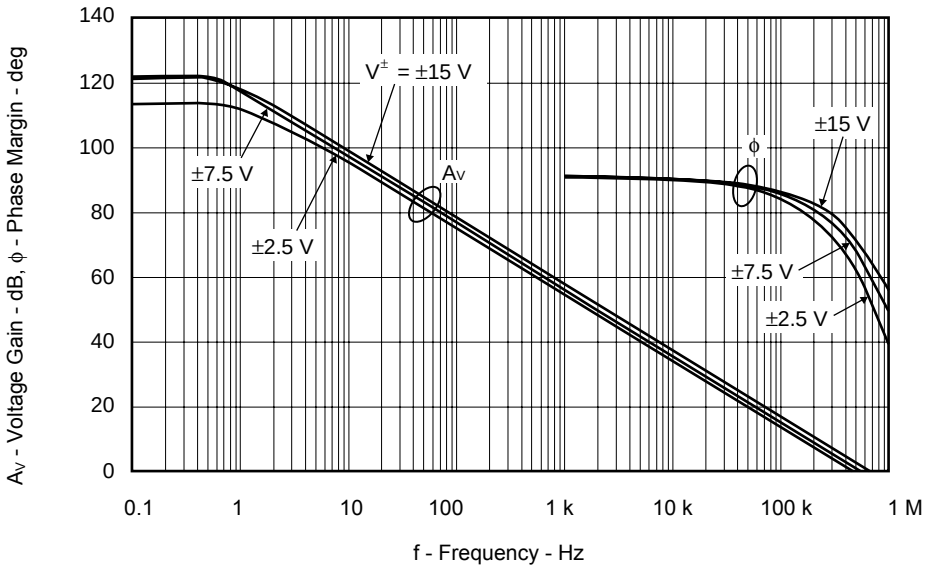
$I_{O\ SHORT}$ vs. T_A



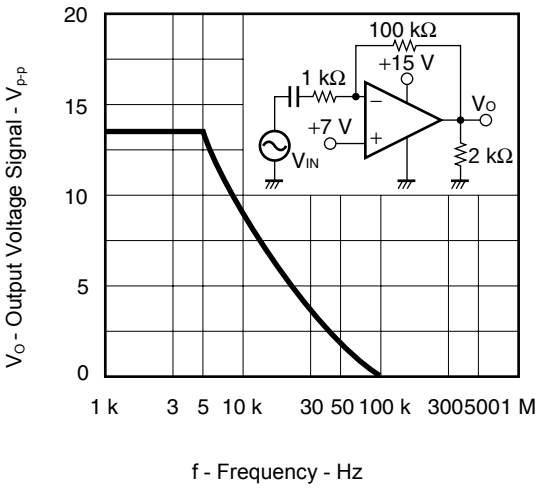
A_V vs. V^+



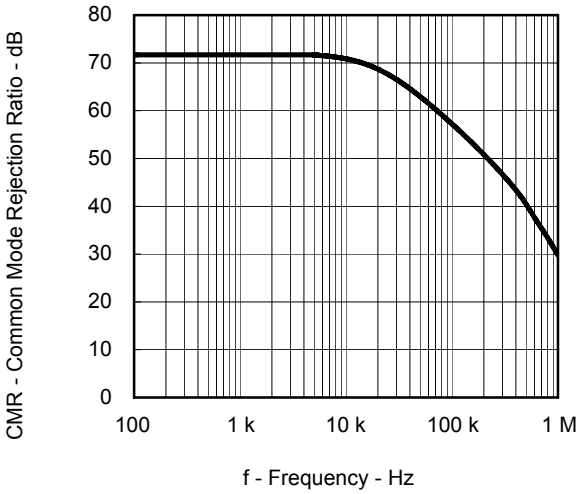
A_V, ϕ vs. f



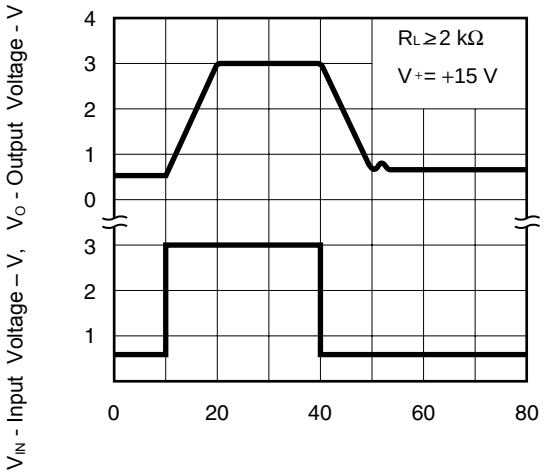
V_O vs. f



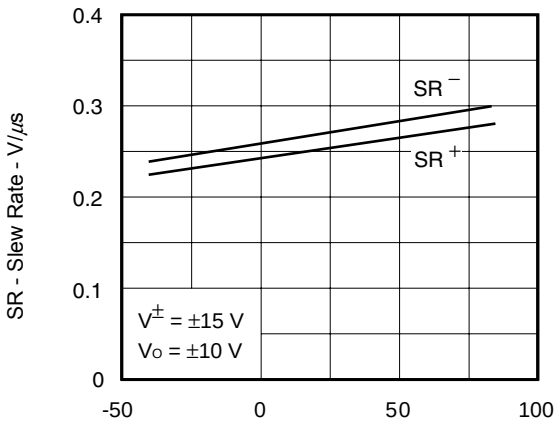
CMR vs. f



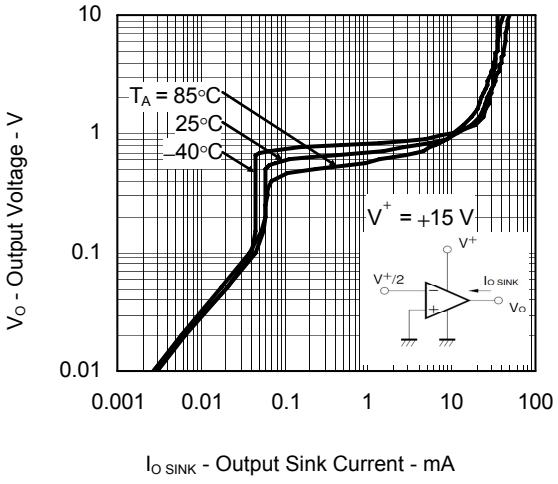
Pulse Response



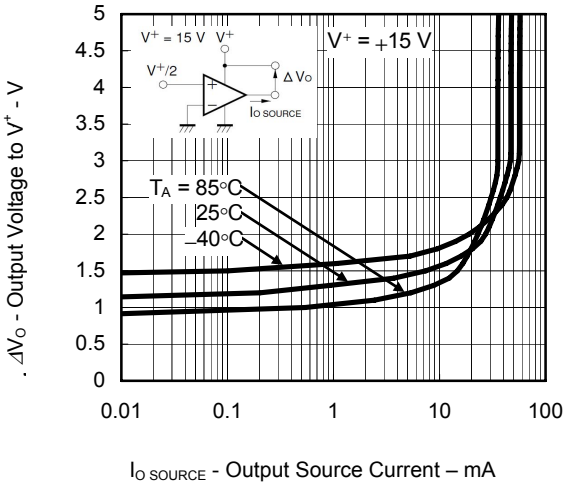
SR - T_A



V_O vs. $I_{O\ SINK}$

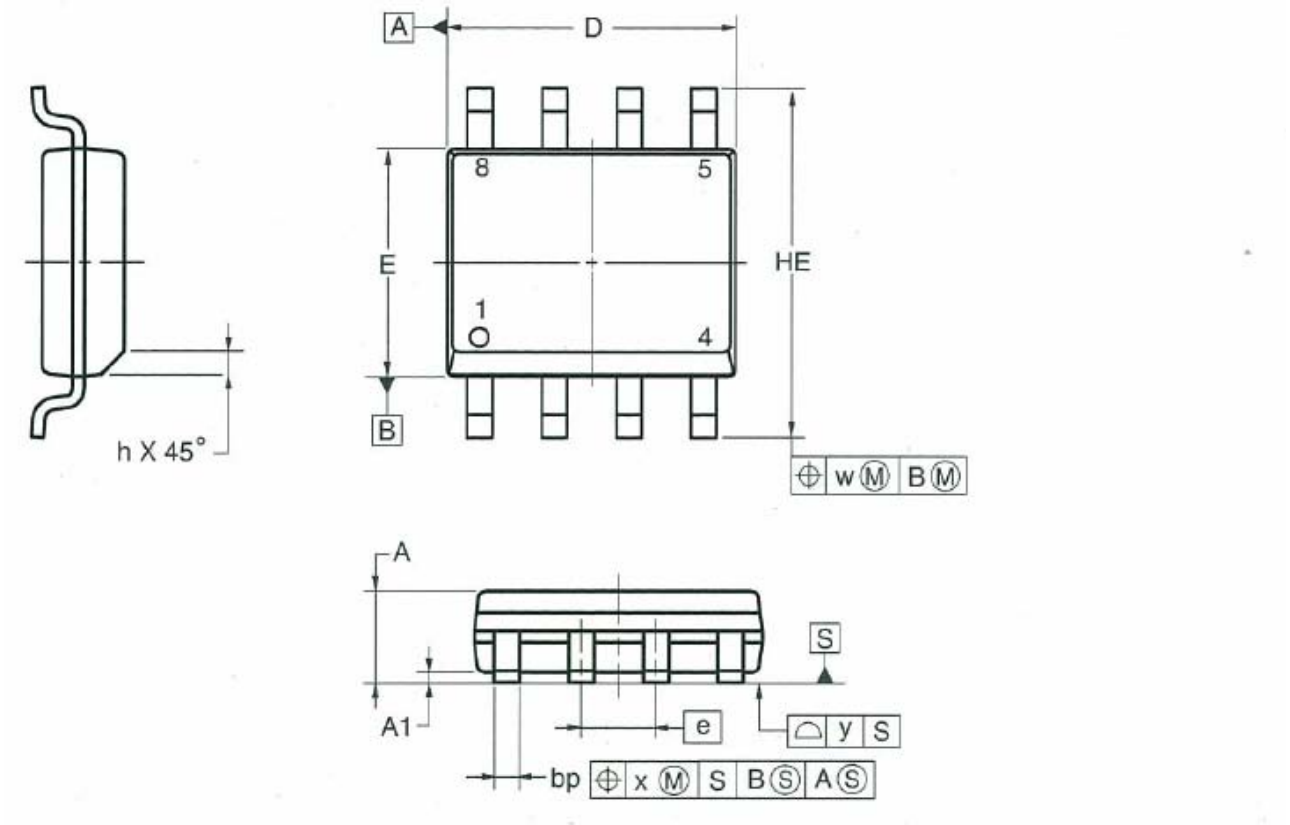


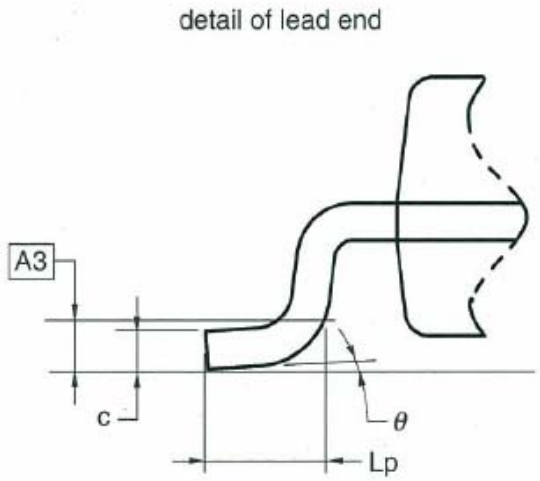
ΔV_O vs. $I_{O\ SOURCE}$



Package Drawings

8-pin Plastic SOP (3.9 × 4.9)





(UNIT:mm)

ITEM	DIMENSIONS
D	4.80 to 5.00
E	3.80 to 4.00
HE	5.80 to 6.20
e	1.27
bp	0.35 to 0.49
A	1.35 to 1.75
A1	0.10 to 0.25
A3	0.25
c	0.19 to 0.25
Lp	0.40 to 1.25
h	0.25 to 0.50
w	0.25
x	0.25
y	0.10
θ	0° to 7°

Recommended Soldering Conditions

The μPC358MF-DAA should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact our sales representative. For technical information, see the following website.

Semiconductor Device Mount Manual (http://www2.renesas.com/pkg/en/mount/index.html)

Recommended Soldering Conditions of Surface Mount Device

Process	Conditions	Symbol
Infrared ray reflow	Peak temperature: 260°C, Reflow time: 60 seconds or less (at 220°C or higher), Maximum number of reflow processes: 3 times.	IR60-00-3
Wave soldering	Solder temperature: 260°C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time, Pre-heating temperature: 120°C or below (Package surface temperature).	WS60-00-1
Partial heating method	Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each side of the device).	P350

Caution Apply only one kind of soldering condition to a device, except for “partial heating method”, or the device will be damaged by heat stress.

Remark Flux: Rosin flux with low chlorine (0.2 Wt% or below) recommended.

Reference Documents

- Quality Grades on NEC Semiconductor Device C11531E
- Semiconductor Device Mount Manual http://www2.renesas.com/pkg/en/mount/index.html
- Review of Quality and Reliability Handbook C12769E
- NEC Semiconductor Device Reliability/Quality Control System C10983E

Revision History	μPC358MF-DAA

Rev.	Date	Description	
		Page	Summary
1.00	Aug 04, 2010	-	First Edition issued

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is "Standard" unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
   - "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.
   - "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
   - "Specific": Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

RENESAS

SALES OFFICES Renesas Electronics Corporation http://www.renesas.com

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

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: +49-211-6503-0, 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.
7F, No. 363 Fu Shing North Road Taipei, Taiwan, R.O.C.
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 Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

Colophon 1.0