μPC393MF-DAA

Bipolar Analog Integrated Circuit

R03DS0006EJ0100
Rev.1.00
Aug 04, 2010

Description

The μPC393MF-DAA is dual comparator 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 open collector output, and low current consumption. Furthermore, this product can operate on a split power supply and be used for an extensive comparison of various voltages.

This package becomes smaller than μPC393G2 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 μPC393G2 by adopting copper-based lead material. ($R_{th(j-a)}$ = 156°C/W)
- Wider Operating Ambient Temperature range than μPC393G2
  — μPC393MF-DAA (T_A = –40 to +85°C), μPC393G2 (T_A = –20 to +80°C)
- Input Offset Voltage ±2 mV (TYP.)
- Input Bias Current 17 nA (TYP.)
- A low voltage operation is possible. $V^+ - V^-$: +2 to +32 V
- Pulse Response Time 1.8 μs (TYP.)
- A wired OR is possible as the open collector is output.

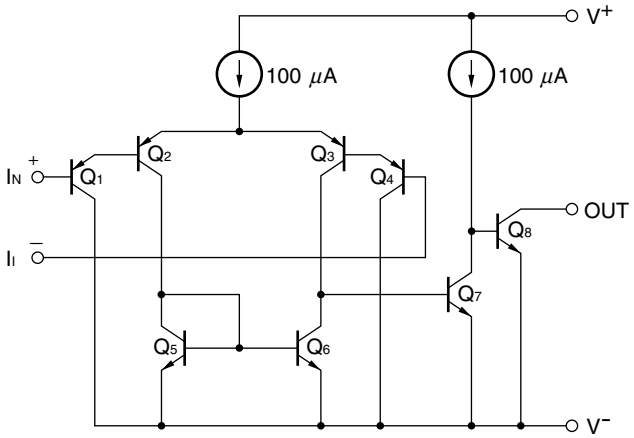
Ordering Information

Part No.	Package	Package Type
μPC393MF-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
μPC393MF-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

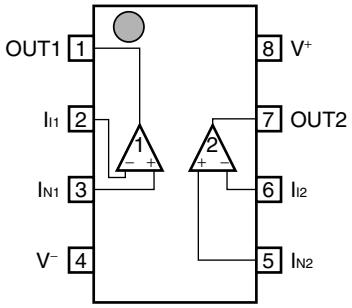
Note: [*]1.Pb-free (This product does not contain Pb in the external electrode and other parts.)

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 +36	V
Differential Input Voltage	V_{ID}	±36	V
Input Voltage *2	V_I	V^- − 0.3 to V^- + 36	V
Output Applied Voltage *3	V_O	V^- − 0.3 to V^- + 36	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.Short circuits from the output to V^+ can cause destruction. Pay careful attention to the total power dissipation not to exceed the absolute maximum ratings, Note 4.

Recommended Operating Conditions

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Power Supply Voltage (Split)	$V^{\pm}$	±1		±16	V
Power Supply Voltage (V^- = GND)	V^+	+2		+32	V

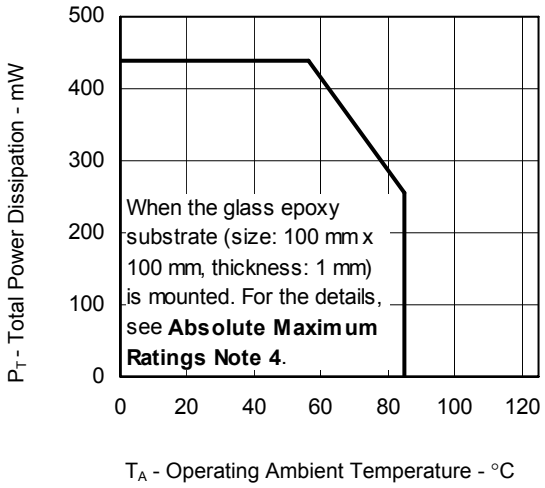
Electrical Characteristics (T_A = 25°C, V^+ = +5 V, V^- = GND)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input Offset Voltage	V_{IO}	V_O = 1.4 V, V_{REF} = 1.4 V, R_S = 0 Ω		±2	±5	mV
Input Offset Current	I_{IO}	V_O = 1.4 V		±5	±50	nA
Input Bias Current *1	I_B	V_O = 1.4 V		17	250	nA
Large Signal Voltage Gain	A_V	R_L = 15 kΩ		200000		
Circuit Current *2	I_{CC}	R_L = ∞, I_O = 0 A		0.6	1.0	mA
Common Mode Input Voltage Range	V_{ICM}		0		V^+−1.5	V
Output Saturation Voltage	V_{OL}	$V_{IN\,(-)}$ = +1 V, $V_{IN\,(+)}$ = 0 V, $I_{O\,SINK}$ = 4 mA		0.2	0.4	V
Output Sink Current	$I_{O\,SINK}$	$V_{IN\,(-)}$ = +1 V, $V_{IN\,(+)}$ = 0 V, $V_O \leq$ 1.5 V	6	16		mA
Output Leakage Current	$I_{O\,LEAK}$	$V_{IN\,(+)}$ = +1 V, $V_{IN\,(-)}$ = 0 V, V_O = 5 V		0.1		nA
Pulse Response Time *3		R_L = 5.1 kΩ, V_{RL} = 5 V		1.8		μs

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.
In addition, the value of this item is a value of when the differential amplified circuit of the input stage is balanced. When the comparator is active, then twice the amount of current will flow to a pin with low potential.
*2.This is a current that flows in the internal circuit. This current will flow irrespective of the channel used.
*3.This is the value when input oscillation is 100 mV and the over drive is 5 mV.
If the amount of over drive is increased then the response time can be cut down.

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

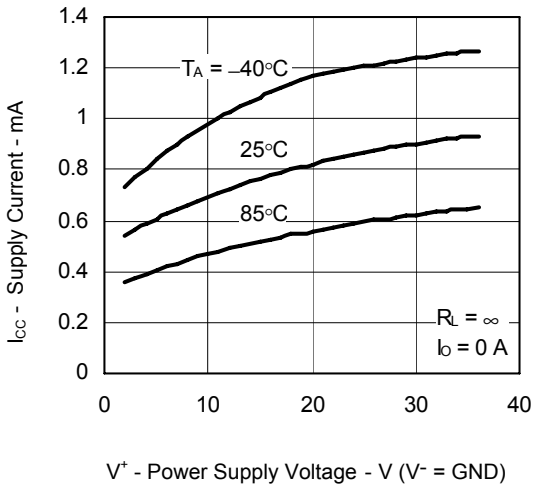
P_T vs. T_A



P_T - Total Power Dissipation - mW

T_A - Operating Ambient Temperature - °C

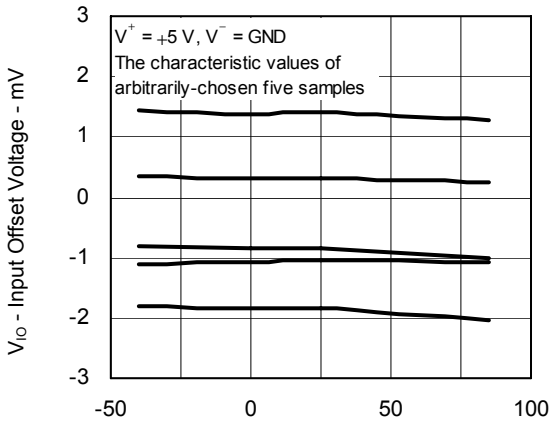
I_{CC} vs. V^+



I_{CC} - Supply Current - mA

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

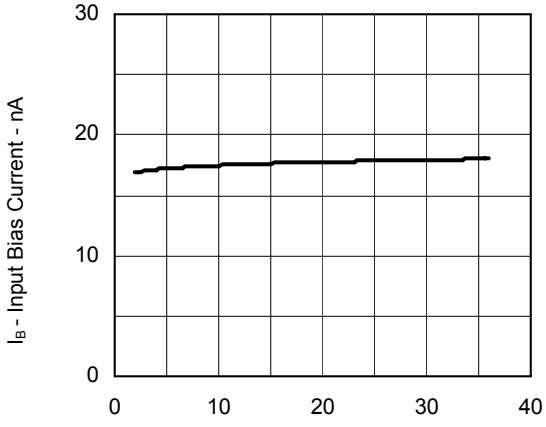
V_{IO} vs. T_A



V_{IO} - Input Offset Voltage - mV

T_A - Operating Ambient Temperature - °C

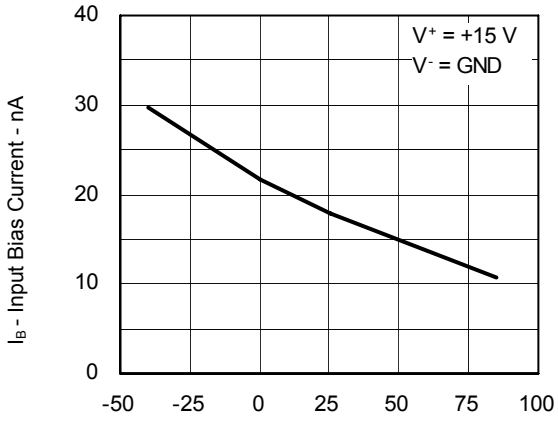
I_B vs. V^+



I_B - Input Bias Current - nA

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

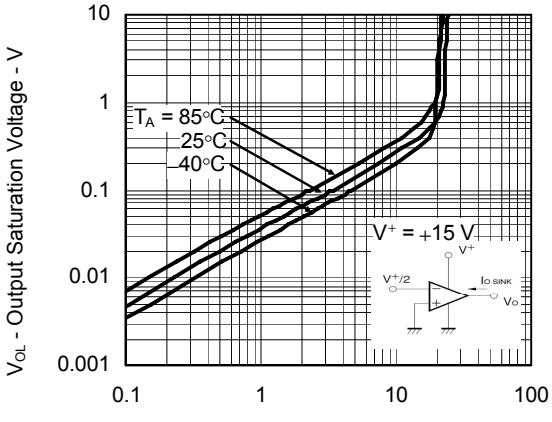
I_B vs. T_A



I_B - Input Bias Current - nA

T_A - Operating Ambient Temperature - °C

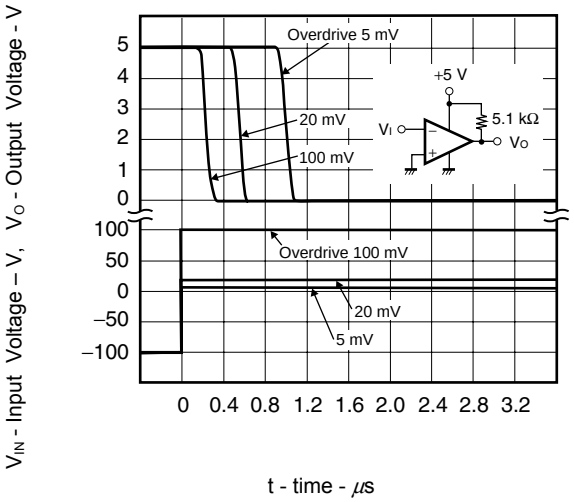
V_{OL} vs. $I_{O\ SINK}$



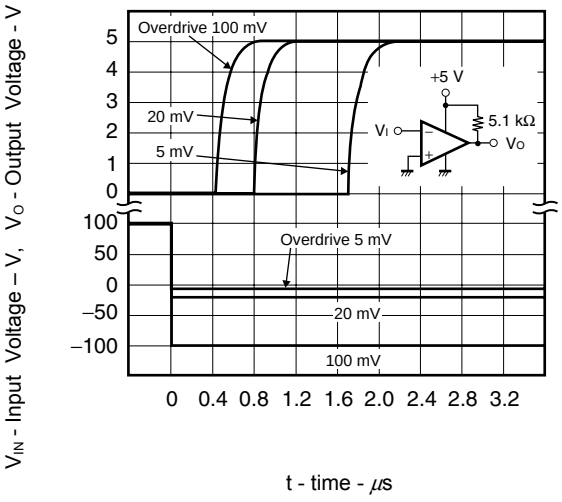
V_{OL} - Output Saturation Voltage - V

$I_{O\ SINK}$ - Output Sink Current - mA

Pulse Response Ⅰ (Output Fall)

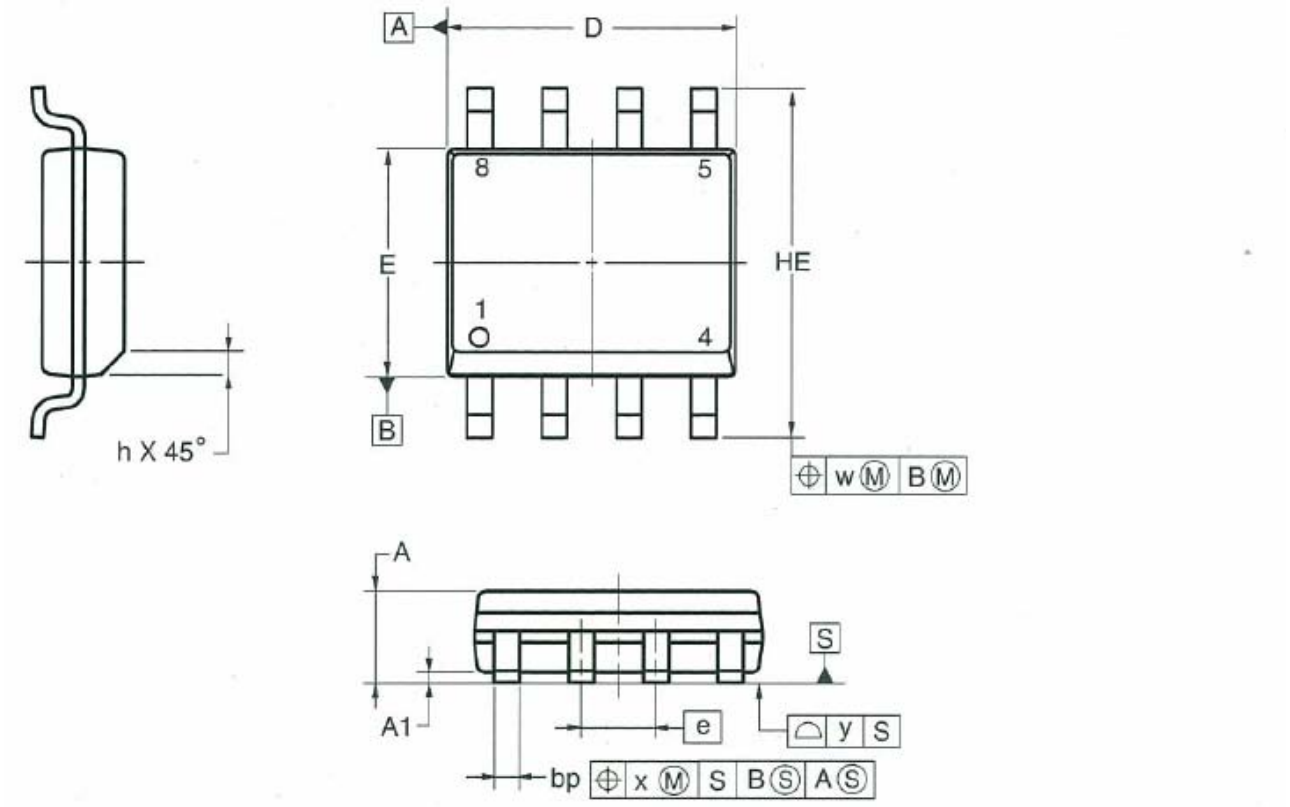


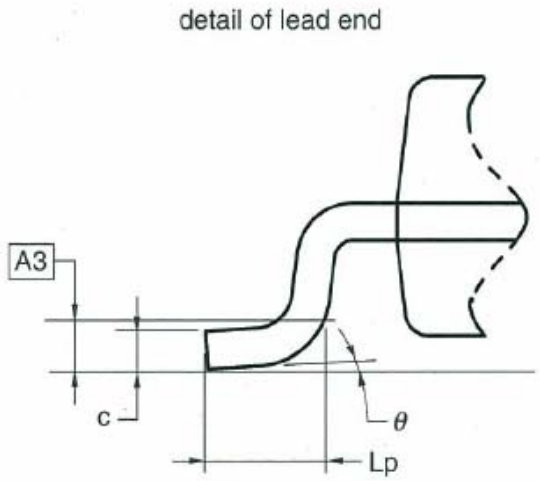
Pulse Response Ⅱ(Output Rise)



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 μPC393MF-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	μPC393MF-DAA

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

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