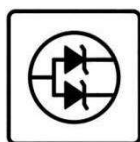
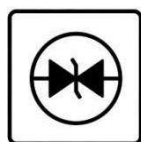


MSKSEMI 美森科

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT



PLED

LM358ADR-MS

Product specification

GENERAL DESCRIPTION

The LM358ADR-MS consists of two independent, high gain and internally frequency compensated operational amplifiers, they are specifically designed to operate from a single power supply. Operation from split power supply is also possible and the low power supply current drain is independent of the magnitude of the power supply voltages. Typical applications include transducer amplifiers, DC gain blocks and most conventional operational amplifier circuits.

The LM358ADR-MS is available in SOP-8 package.

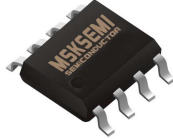

FEATURES

- Internally Frequency Compensated for Unity Gain
- Large Voltage Gain: 100dB (Typical)
- Low Input Bias Current: 20nA (Typical)
- Low Input Offset Voltage: 2mV (Typical)
- Low Supply Current: 0.5mA (Typical)
- Wide Power Supply Voltage:
Single Supply: 3V to 36V
Dual Supplies: $\pm 1.5V$ to $\pm 18V$
- Input Common Mode Voltage Range Includes Ground
- Large Output Voltage Swing: 0V to $V_{CC} - 1.5V$
- Lead-Free Packages: SOP-8

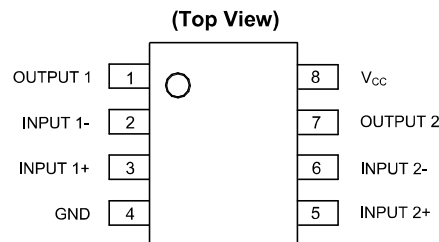
Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply

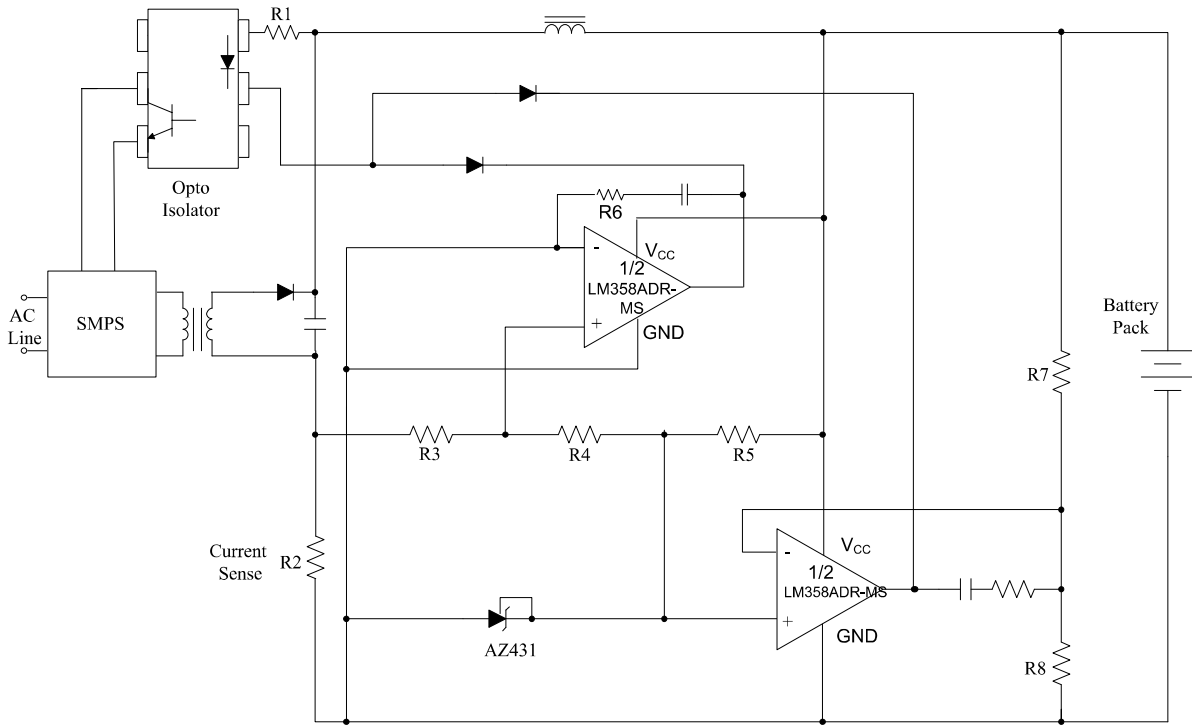
Reference News

Type No	SOP-8	MARKING
LM358ADR-MS		

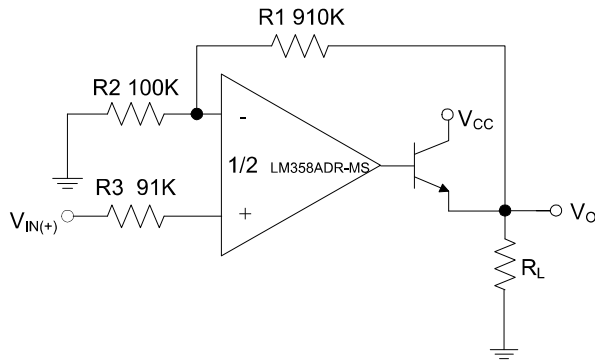
Pin Assignments



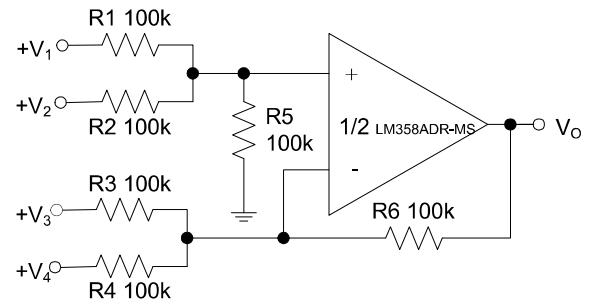
Typical Applications Circuit



Battery Charger

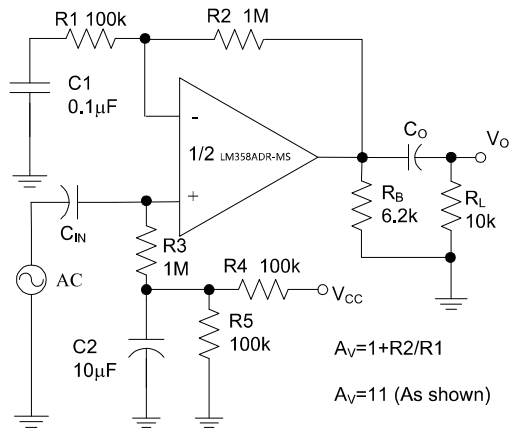


Power Amplifier

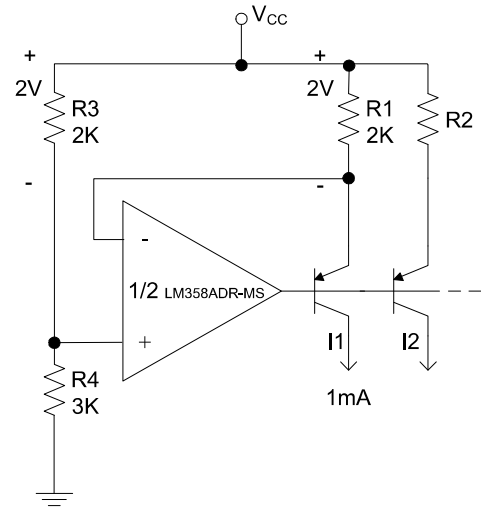


DC Summing Amplifier

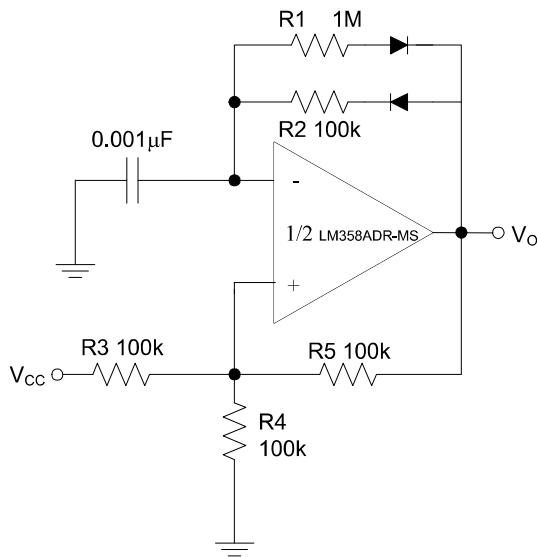
Typical Applications Circuit (Cont.)



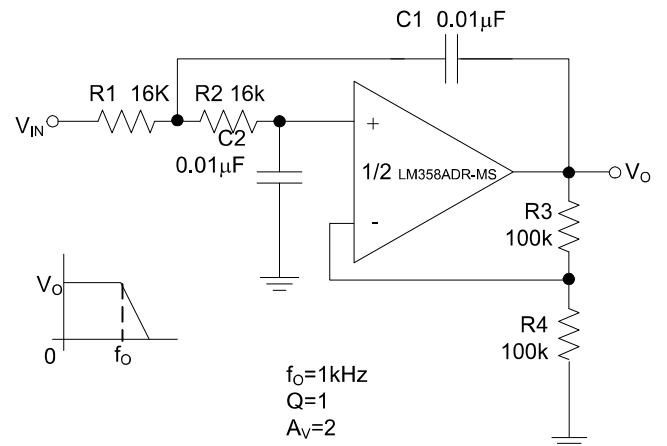
AC Coupled Non-Inverting Amplifier



Fixed Current Sources

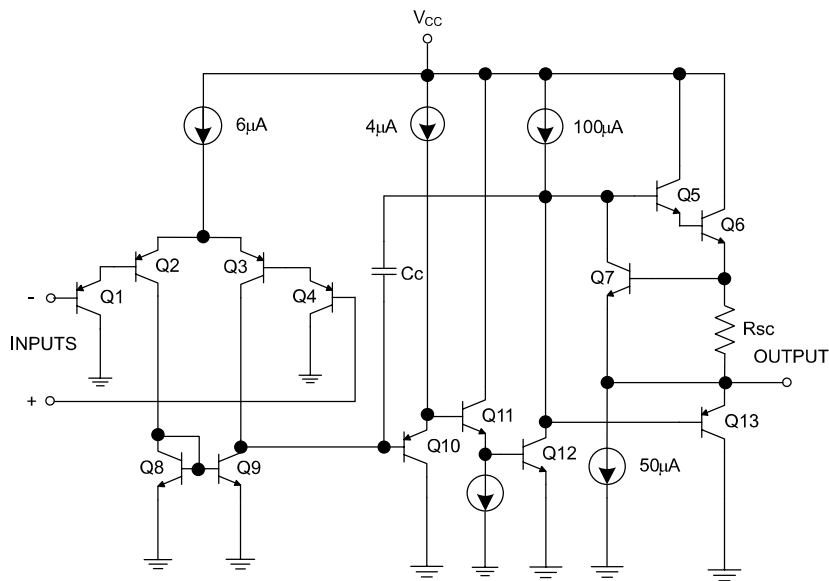


Pulse Generator



DC Coupled Low-Pass Active Filter

Functional Block Diagram



Absolute Maximum Ratings (Notes 1 & 2)

Symbol	Parameter	Rating	Unit
V _{CC}	Power Supply Voltage	40	V
V _{ID}	Differential Input Voltage	40	V
V _{IC}	Input Voltage	-0.3 to 40	V
P _D	Power Dissipation (T _A = +25°C)	500	mW
T _J	Operating Junction Temperature	+150	°C
T _{STG}	Storage Temperature Range	-65 to +150	°C
T _{LEAD}	Lead Temperature (Soldering, 10 Seconds)	+260	°C

Notes: 1. Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

2. ESD sensitivity.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V _{CC}	Supply Voltage	3	36	V
T _A	Ambient Operating Temperature Range	-40	+85	°C

Electrical Characteristics (Limits in standard typeface are for $T_A = +25^\circ\text{C}$, bold typeface applies over -40°C to $+85^\circ\text{C}$ (Note 6), $V_{CC} = 5\text{V}$, $GND = 0\text{V}$, unless otherwise specified.)

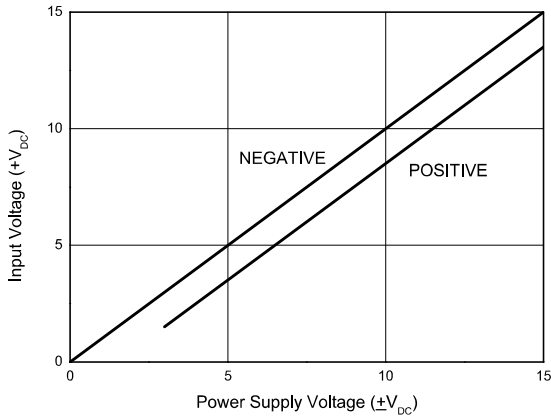
Symbol	Parameter		Conditions	Min	Typ	Max	Unit
V_{IO}	Input Offset Voltage		$V_O = 1.4\text{V}$, $R_S = 0\Omega$, $V_{CC} = 5\text{V}$ to 30V	—	2	5	mV
				—	—	7	
$\Delta V_{IO}/\Delta T$	Average Temperature Coefficient of Input Offset Voltage		$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$	—	7	—	$\mu\text{V}/^\circ\text{C}$
I_{BIAS}	Input Bias Current		I_{IN+} or I_{IN-} , $V_{CM} = 0\text{V}$	—	20	200	nA
				—	—	200	
I_{IO}	Input Offset Current		$I_{IN+} - I_{IN-}$, $V_{CM} = 0\text{V}$	—	5	30	nA
				—	—	100	
V_{IR}	Input Common Mode Voltage Range (Note 2)		$V_{CC} = 30\text{V}$	0	—	$V_{CC} - 1.5$	V
I_{CC}	Supply Current		$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $R_L = \infty$, $V_{CC} = 30\text{V}$	—	0.7	2	mA
			$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $R_L = \infty$, $V_{CC} = 5\text{V}$	—	0.5	1.2	
G_V	Large Signal Voltage Gain		$V_{CC} = 15\text{V}$, $V_O = 1\text{V}$ to 11V , $R_L \geq 2\text{k}\Omega$	85	100	—	dB
				80	—	—	
CMRR	Common Mode Rejection Ratio		DC, $V_{CM} = 0\text{V}$ to $(V_{CC}-1.5)\text{V}$	60	70	—	dB
				60	—	—	
PSRR	Power Supply Rejection Ratio		$V_{CC} = 5\text{V}$ to 30V	70	100	—	dB
				60	—	—	
CS	Channel Separation		$f = 1\text{kHz}$ to 20kHz	—	-120	—	dB
I_{SOURCE}	Output Current	Source	$V_{IN+} = 1\text{V}$, $V_{IN-} = 0\text{V}$, $V_{CC} = 15\text{V}$, $V_O = 2\text{V}$	20	40	—	mA
		Sink	$V_{IN+} = 0\text{V}$, $V_{IN-} = 1\text{V}$, $V_{CC} = 15\text{V}$, $V_O = 2\text{V}$	10	15	—	
I_{SINK}	Output Current	Sink	$V_{IN+} = 0\text{V}$, $V_{IN-} = 1\text{V}$, $V_{CC} = 15\text{V}$, $V_O = 2\text{V}$	5	—	—	mA
			$V_{IN+} = 0\text{V}$, $V_{IN-} = 1\text{V}$, $V_{CC} = 15\text{V}$, $V_O = 0.2\text{V}$	12	50	—	
I_{SC}	Output Short Circuit Current to Ground		$V_{CC} = 15\text{V}$	—	40	60	mA
V_{OH}	Output Voltage Swing		$V_{CC} = 30\text{V}$, $R_L = 2\text{k}\Omega$	26	—	—	V
				26	—	—	
			$V_{CC} = 30\text{V}$, $R_L = 10\text{k}\Omega$	27	28	—	
				27	—	—	
V_{OL}	Output Voltage Swing		$V_{CC} = 5\text{V}$, $R_L = 10\text{k}\Omega$	—	5	20	mV
				—	—	30	
θ_{JC}	Thermal Resistance (Junction to Case)			—	17	—	$^\circ\text{C}/\text{W}$
θ_{JA}	Thermal Resistance (Junction to Ambient)			—	115	—	

Notes: 1. Limits over the full temperature are guaranteed by design, but not tested in production.

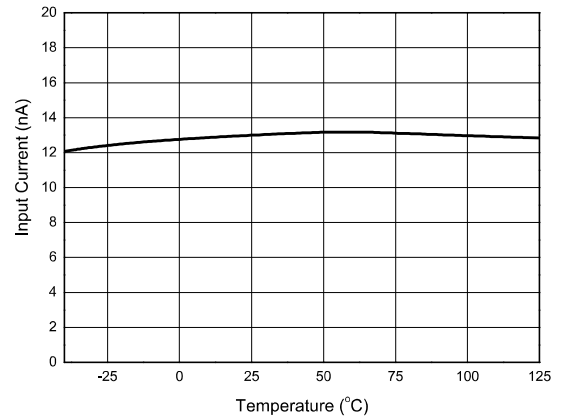
2. The input common-mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at $+25^\circ\text{C}$). The upper end of the common-mode voltage range is $V_{CC}-1.5\text{V}$ (at $+25^\circ\text{C}$), but either or both inputs can go to $+36\text{V}$ without damages, independent of the magnitude of the V_{CC} .

Performance Characteristics

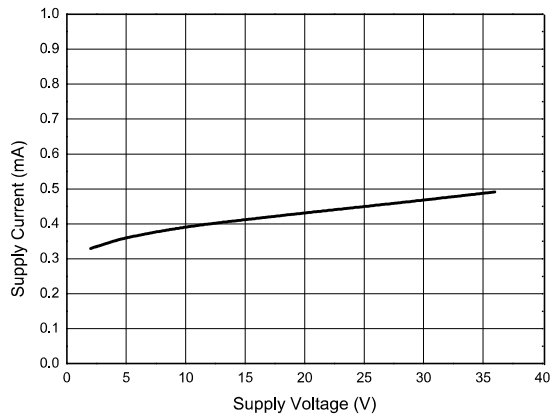
Input Voltage Range



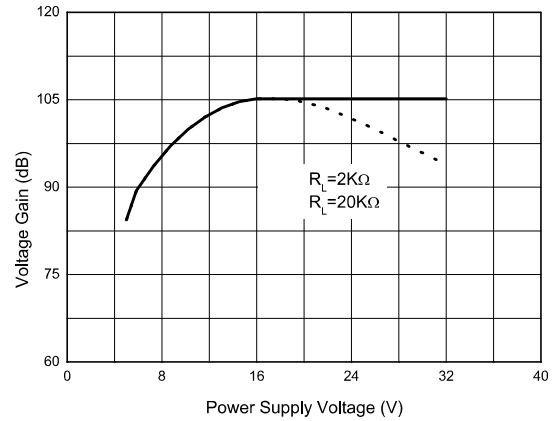
Input Current



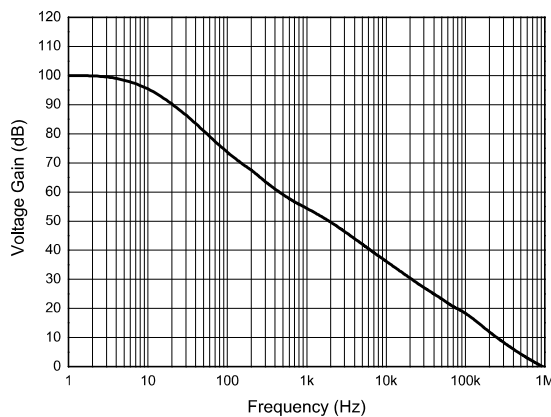
Supply Current



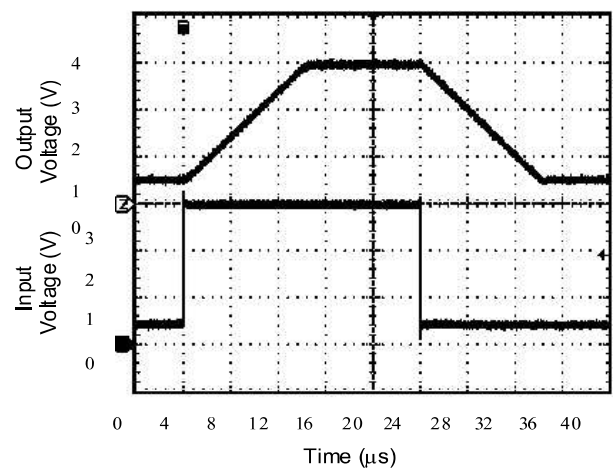
Voltage Gain



Open Loop Frequency Response

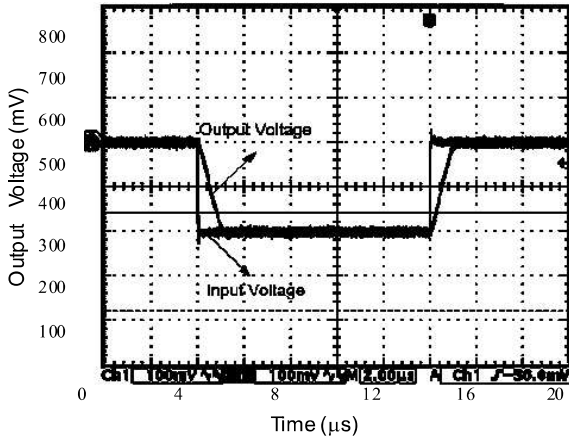


Voltage Follower Pulse Response

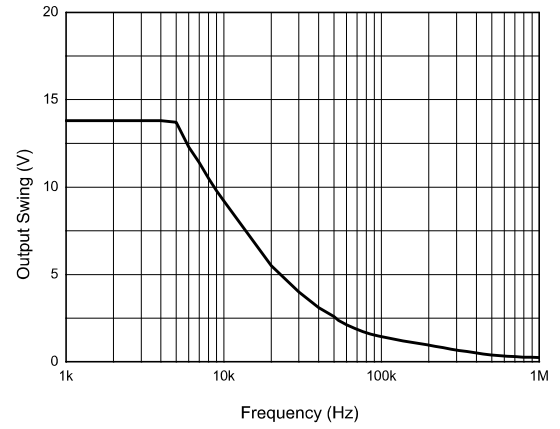


Performance Characteristics (Cont.)

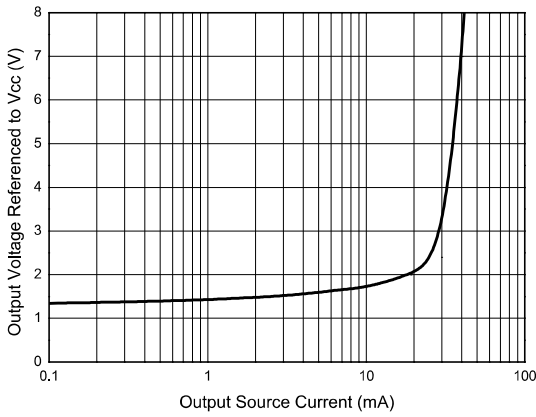
Voltage Follower Pulse Response (Small Signal)



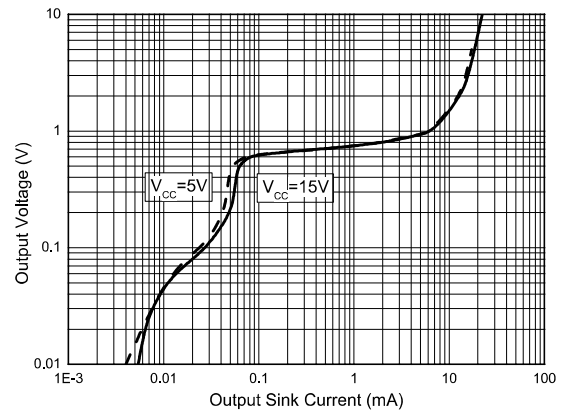
Large Signal Frequency Response



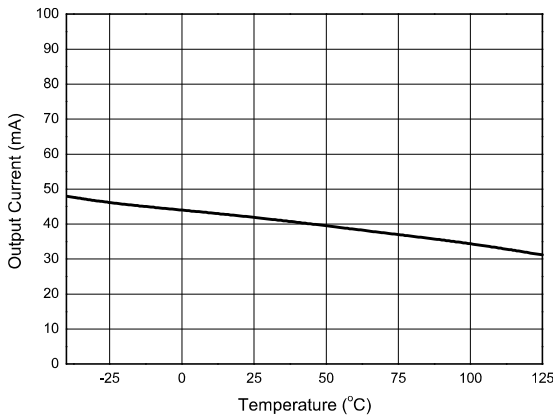
Output Characteristics: Current Sourcing



Output Characteristics: Current Sinking

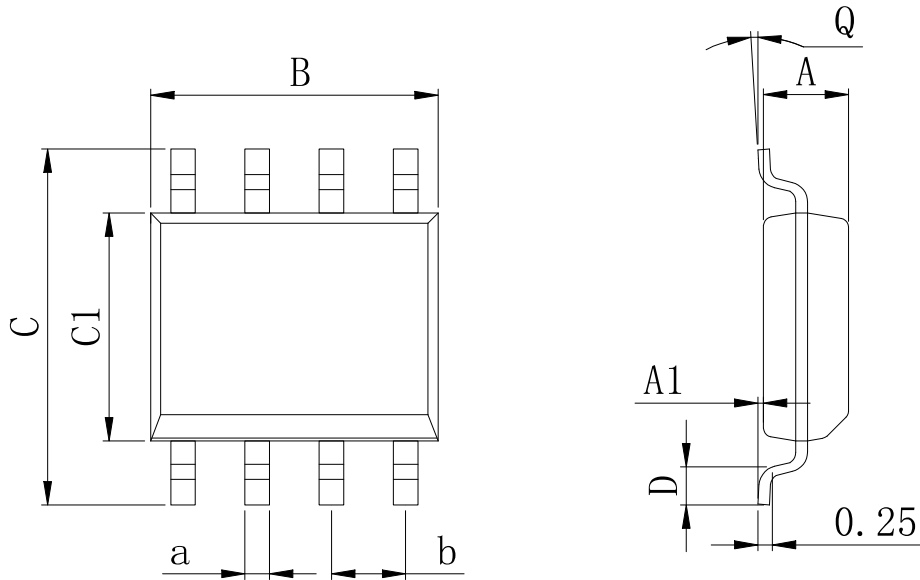


Current Limiting



Physical Dimensions

SOP-8



Dimensions In Millimeters(SOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

ORDER INFORMATION

P/N	PKG	QTY
LM358ADR-MS	SOP-8	2500

Attention

- Any and all MSKSEMI Semiconductor products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your MSKSEMI Semiconductor representative nearest you before using any MSKSEMI Semiconductor products described or contained herein in such applications.
- MSKSEMI Semiconductor assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all MSKSEMI Semiconductor products described or contained herein.
- Specifications of any and all MSKSEMI Semiconductor products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- MSKSEMI Semiconductor strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all MSKSEMI Semiconductor products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of MSKSEMI Semiconductor.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. MSKSEMI Semiconductor believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the MSKSEMI Semiconductor product that you intend to use.