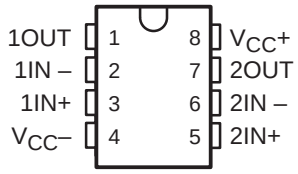
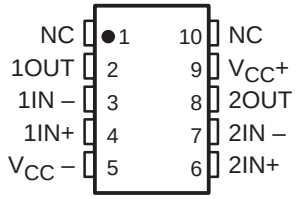
SLOS069A – FEBRUARY 1971 – REVISED MAY1999

- **Short-Circuit Protection**
- **Wide Common-Mode and Differential Voltage Ranges**
- **No Frequency Compensation Required**
- **Low Power Consumption**
- **No Latch-Up**
- **Designed to Be Interchangeable With Motorola MC1558/MC1458 and Signetics S5558/N5558**

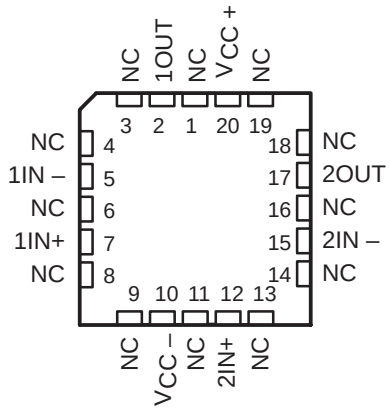
MC1458 . . . D OR P PACKAGE
MC1558 . . . JG PACKAGE
(TOP VIEW)



MC1558 . . . U PACKAGE
(TOP VIEW)



MC1558 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

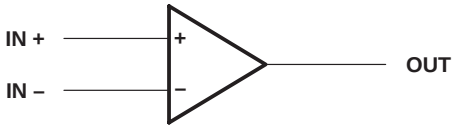
description

The MC1458 and MC1558 are dual general-purpose operational amplifiers, with each half electrically similar to the μA741, except that offset null capability is not provided.

The high-common-mode input voltage range and the absence of latch-up make these amplifiers ideal for voltage-follower applications. The devices are short-circuit protected and the internal frequency compensation ensures stability without external components.

The MC1458 is characterized for operation from 0°C to 70°C. The MC1558 is characterized for operation over the full military temperature range of –55°C to 125°C.

symbol (each amplifier)

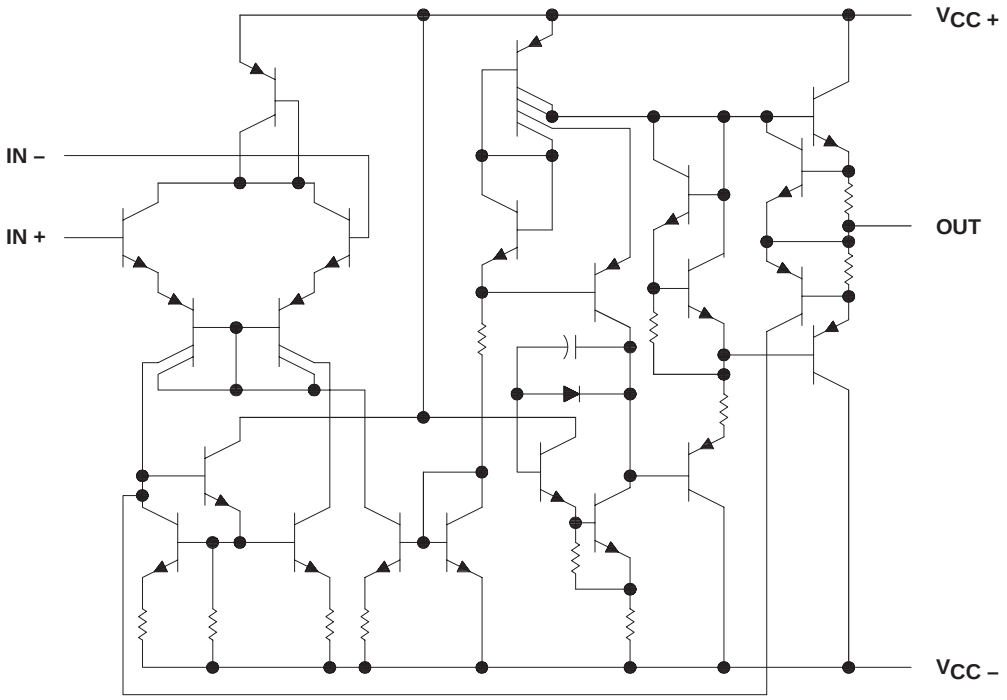


AVAILABLE OPTIONS

T_A	V_{IO}max AT 25°C	PACKAGE				
		SMALL OUTLINE (D)	CHIP CARRIER (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)	CERAMIC FLAT PACK (U)
0°C to 70°C	6 mV	MC1458CD	—	—	MC1458CP	—
–55°C to 125°C	5 mV	—	MC1558MFK	MC1558MSG	—	MC1558MU

The D packages are available taped and reeled. Add the suffix R to the device type (i.e., MC1458DR)

schematic (each amplifier)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

		MC1458	MC1558	UNIT
Supply voltage (see Note 1)	V_{CC+}	18	22	V
	V_{CC-}	–18	–22	
Differential input voltage (see Note 2)		±30	±30	V
Input voltage at either input (see Notes 1 and 3)		±15	±15	V
Duration of output short circuit (see Note 4)		unlimited	unlimited	
Continuous total dissipation		See Dissipation Rating Table		
Case temperature for 60 seconds: FK package			260	°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	JG or U package		300	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	D or P package	260		°C
Storage temperature range		65 to 150	–65 to 150	°C

NOTES: 1. All voltage values, unless otherwise noted, are with respect to the midpoint between V_{CC+} and V_{CC-}.
2. Differential voltages are at IN+ with respect to IN–.
3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
4. The output can be shorted to ground or either power supply. For the MC1558 only, the unlimited duration of the short circuit applies at (or below) 125°C case temperature or 70°C free-air temperature.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR	DERATE ABOVE T_A	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ POWER RATING
D	680 mW	5.8 mW/°C	33°C	464 mW	—
FK	680 mW	11.0 mW/°C	88°C	880 mW	275 mW
JG	680 mW	8.4 mW/°C	69°C	672 mW	210 mW
P	680 mW	8.0 mW/°C	65°C	640 mW	—
U	675 mW	5.4 mW/°C	25°C	432 mW	135 mW

recommended operating conditions

		MIN	MAX	UNIT
Supply voltage, $V_{CC\pm}$		±5	±15	V
Operating free-air temperature range, T_A	MC1458	0	70	°C
	MC1558	–55	125	

electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

PARAMETER		TEST CONDITIONS†		MC1458			MC1558			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	V_O = 0	25°C		1	6		1	5	mV
			Full range			7.5			6	
I_{IO}	Input offset current	V_O = 0	25°C		20	200		20	200	nA
			Full range			300			500	
I_{IB}	Input bias current	V_O = 0	25°C		80	500		80	500	nA
			Full range			800			1500	
V_{ICR}	Common-mode input voltage range		25°C	±12	±13		±12	±13		V
			Full range	±12			±12			
V_{OM}	Maximum peak output voltage swing	R_L = 10 kΩ	25°C	±12	±14		±12	±14		V
		R_L ≥ 10 kΩ	Full range	±12			±12			
		R_L = 2 kΩ	25°C	±10	±13		±10	±13		
		R_L ≥ 2 kΩ	Full range	±10			±10			
A_{VD}	Large-signal differential voltage amplification	R_L ≥ 2 kΩ, V_O = ±10 V	25°C	20	200		50	200		V/mV
			Full range	15			25			
B_{OM}	Maximum-output-swing bandwidth (closed loop)	R_L = 2 kΩ, V_O ≥ ±10 V, A_{VD} = 1, THD ≥ 5%	25°C		14			14		kHz
B_1	Unity-gain bandwidth		25°C		1			1		MHz
ϕm	Phase margin	A_{VD} = 1	25°C		65			65		deg
	Gain margin		25°C		11			11		dB
r_i	Input resistance		25°C	0.3	2		0.3*	2		MΩ
r_o	Output resistance	V_O = 0, See Note 5	25°C		75			75		Ω
C_i	Input capacitance		25°C		1.4			1.4		pF
z_{ic}	Common-mode input impedance	f = 20 Hz	25°C		200			200		MΩ
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR} min, V_O = 0	25°C	70	90		70	90		dB
			Full range	70			70			
k_{SVS}	Supply-voltage sensitivity ($\Delta V_{IO}/\Delta V_{CC}$)	V_{CC} = ± 9 V to ±15 V, V_O = 0	25°C		30	150		30	150	μV/V
			Full range			150			150	
V_n	Equivalent input noise voltage (closed loop)	A_{VD} = 100, R_S = 0, f = 1 kHz, BW = 1 Hz	25°C		45			45		nV/√Hz

*On products compliant to MIL-PRF-38535, this parameter is not production tested.

† All characteristics are specified under open-loop operating conditions with zero common-mode input voltage unless otherwise specified. Full range for MC1458 is 0°C to 70°C and for MC1558 is –55°C to 125°C.

NOTE 5: This typical value applies only at frequencies above a few hundred hertz because of the effect of drift and thermal feedback.

electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (continued)

PARAMETER		TEST CONDITIONS†		MC1458			MC1558			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
I_{OS}	Short-circuit output current		25°C		±25	±40		±25	±40	mA
I_{CC}	Supply current (both amplifiers)	V_O = 0, No load	25°C		3.4	5.6		3.4	5	mA
			Full range			6.6			6.6	
P_D	Total power dissipation (both amplifiers)	V_O = 0, No load	25°C		100	170		100	150	mW
			Full range			200			200	
V_{O1}/V_{O2}	Crosstalk attenuation		25°C		120			120		dB

† All characteristics are specified under open-loop operating conditions with zero common-mode input voltage unless otherwise specified. Full range for MC1458 is 0°C to 70°C and for MC1558 is –55°C to 125°C.

operating characteristics, $V_{CC\pm}$ = ±15 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		MC1458			MC1558			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_r	Rise time	V_I = 20 mV, C_L = 100 pF,	R_L = 2 kΩ, See Figure 1		0.3			0.3		µs
	Overshoot factor				5%			5%		
SR	Slew rate at unity gain	V_I = 10 V, C_L = 100 pF,	R_L = 2 kΩ, See Figure 1		0.5			0.5		V/µs

PARAMETER MEASUREMENT INFORMATION

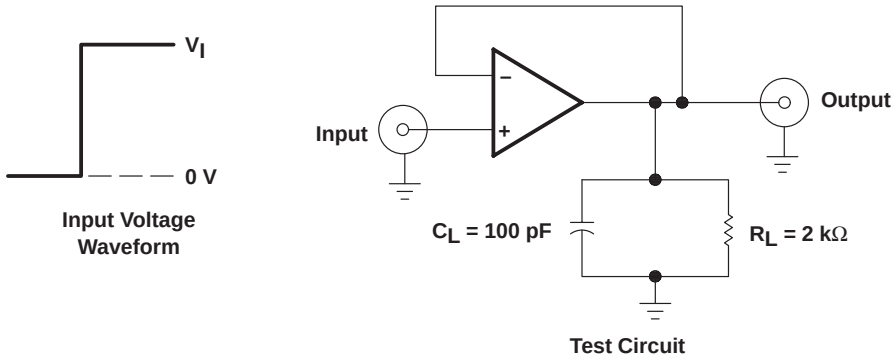


Figure 1. Rise-Time, Overshoot, and Slew-Rate Waveform and Test Circuit

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.