

MC1458, MC1558 DUAL GENERAL-PURPOSE OPERATIONAL AMPLIFIERS

SLOS069B – FEBRUARY 1971 – REVISED SEPTEMBER 2002

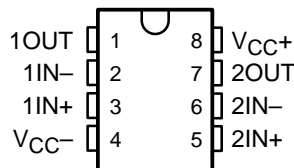
- Short-Circuit Protection
- Wide Common-Mode and Differential Voltage Ranges
- No Frequency Compensation Required
- Low Power Consumption
- No Latch-Up
- Designed to Be Interchangeable With Motorola MC1558/MC1458 and Signetics S5558/N5558

description/ordering information

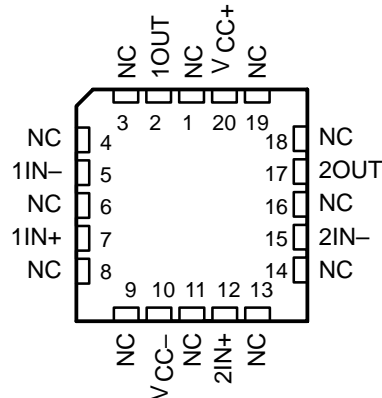
The MC1458 and MC1558 are dual general-purpose operational amplifiers, with each half electrically similar to the μ A741, except that offset null capability is not provided.

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.

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



MC1558 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

ORDERING INFORMATION

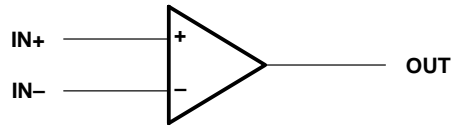
T_A	V_{IOmax} AT 25°C	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	6 mV	PDIP (P)	Tube	MC1458P	MC1458P
		SOIC (D)	Tube	MC1458D	MC1458
			Tape and reel	MC1458DR	
		SOP (PS)	Tape and reel	MC1458PSR	M1458
–55°C to 125°C	5 mV	CDIP (JG)	Tube	MC1558JG	MC1558JG
		CDIP (JGB)	Tube	MC1558JGB	MC1558JGB
		LCCC (FK)	Tube	MC1558FK	MC1558FK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

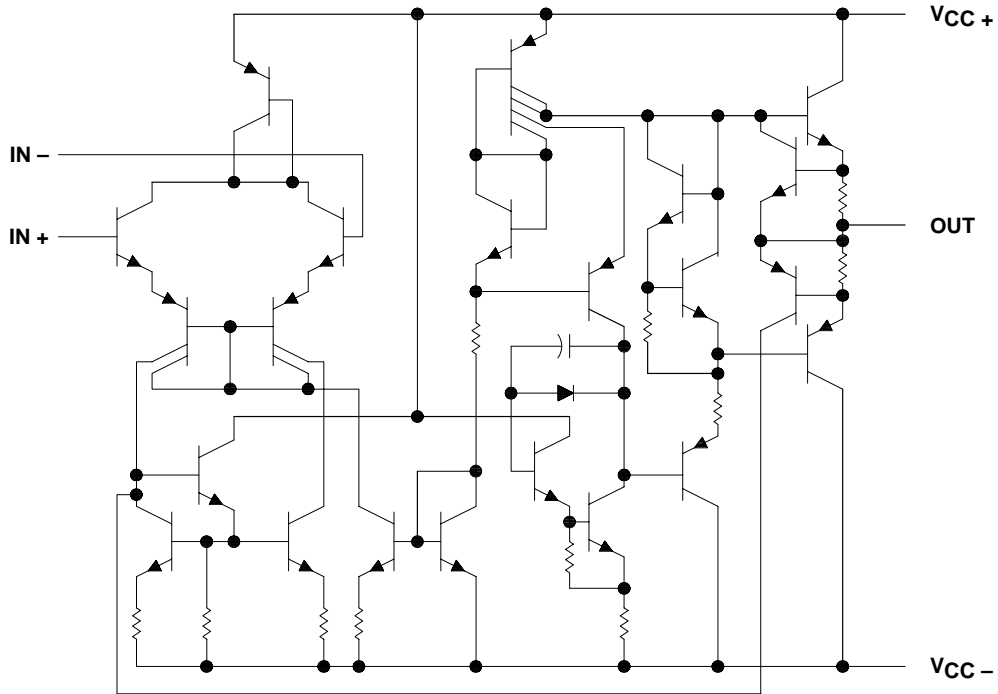
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symbol (each amplifier)



schematic (each amplifier)



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

Supply voltage, V_{CC+} (see Note 1):	MC1458	18 V
	MC1558	22 V
Supply voltage, V_{CC-} (see Note 1):	MC1458	-18 V
	MC1558	-22 V
Differential input voltage, V_{ID} (see Note 2)	± 30 V
Input voltage, V_I (either input, see Notes 1 and 3)	± 15 V
Duration of output short circuit (see Note 4)	.....	Unlimited
Operating virtual junction temperature, T_J	.....	150°C
Package thermal impedance, θ_{JA} (see Notes 5 and 6):	D package	97°C/W
	P package	85°C/W
	PS package	95°C/W
Package thermal impedance, θ_{JC} (see Notes 7 and 8):	FK package	5.61°C/W
	JG package	14.5°C/W
Case temperature for 60 seconds: FK package	.....	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: JG package	.....	300°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: D, P, or PS package	.....	260°C
Storage temperature range, T_{stg}	.....	-65°C to 150°C

† Stresses beyond 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-rated conditions for extended periods may affect device reliability.

- 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.
 5. Maximum power dissipation is a function of $T_J(max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 6. The package thermal impedance is calculated in accordance with JESD 51-7.
 7. Maximum power dissipation is a function of $T_J(max)$, θ_{JC} , and T_C . The maximum allowable power dissipation at any allowable case temperature is $P_D = (T_J(max) - T_C)/\theta_{JC}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 8. The package thermal impedance is calculated in accordance with MIL-STD-883.

recommended operating conditions

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



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

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	$R_L = 10\text{ k}\Omega$	25°C	±12	±14	±12	±14	V	
	$R_L \geq 10\text{ k}\Omega$	Full range	±12		±12			
	$R_L = 2\text{ k}\Omega$	25°C	±10	±13	±10	±13		
	$R_L \geq 2\text{ k}\Omega$	Full range	±10		±10			
A_{VD} Large-signal differential voltage amplification	$R_L \geq 2\text{ k}\Omega, V_O = \pm 10\text{ V}$	25°C	20	200	50	200	V/mV	
		Full range	15		25			
B_{OM} Maximum-output-swing bandwidth (closed loop)	$R_L = 2\text{ k}\Omega, A_{VD} = 1, THD \geq 5\%$	25°C		14		14	kHz	
B_1 Unity-gain bandwidth		25°C		1		1	MHz	
ϕ_m Phase margin	$A_{VD} = 1$	25°C		65		65	deg	
		Gain margin	25°C		11			11
r_i Input resistance		25°C	0.3	2	0.3*	2	M Ω	
r_o Output resistance	$V_O = 0, \text{ See Note 9}$	25°C		75		75	Ω	
C_i Input capacitance		25°C		1.4		1.4	pF	
z_{ic} Common-mode input impedance	$f = 20\text{ Hz}$	25°C		200		200	M Ω	
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICR}\text{ min}, V_O = 0$	25°C	70	90	70	90	dB	
		Full range	70		70			
k_{SVS} Supply-voltage sensitivity ($\Delta V_{IO}/\Delta V_{CC}$)	$V_{CC} = \pm 9\text{ V to } \pm 15\text{ V}, V_O = 0$	25°C	30	150	30	150	$\mu\text{V/V}$	
		Full range		150		150		
V_n Equivalent input noise voltage (closed loop)	$A_{VD} = 100, f = 1\text{ kHz}, R_S = 0, BW = 1\text{ Hz}$	25°C		45		45	$\text{nV}/\sqrt{\text{Hz}}$	
I_{OS} Short-circuit output current		25°C	±25	±40	±25	±40	mA	
I_{CC} Supply current (both amplifiers)	$V_O = 0, \text{ No load}$	25°C	3.4	5.6	3.4	5	mA	
		Full range		6.6		6.6		
P_D Total power dissipation (both amplifiers)	$V_O = 0, \text{ No load}$	25°C	100	170	100	150	mW	
		Full range		200		200		
V_{O1}/V_{O2} Crosstalk attenuation		25°C		120		120	dB	

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



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operating characteristics, $V_{CC\pm} = \pm 15\text{ V}$, $C_L = 100\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Figure 1)

PARAMETER		TEST CONDITIONS		MC1458			MC1558			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
t_r	Rise time	$V_I = 20\text{ mV}$,	$R_L = 2\text{ k}\Omega$,	0.3			0.3			μs
	Overshoot factor	$V_I = 20\text{ mV}$,	$R_L = 2\text{ k}\Omega$	5			5			%
SR	Slew rate at unity gain	$V_I = 10\text{ V}$,	$R_L = 2\text{ k}\Omega$	0.5			0.5			$\text{V}/\mu\text{s}$

PARAMETER MEASUREMENT INFORMATION

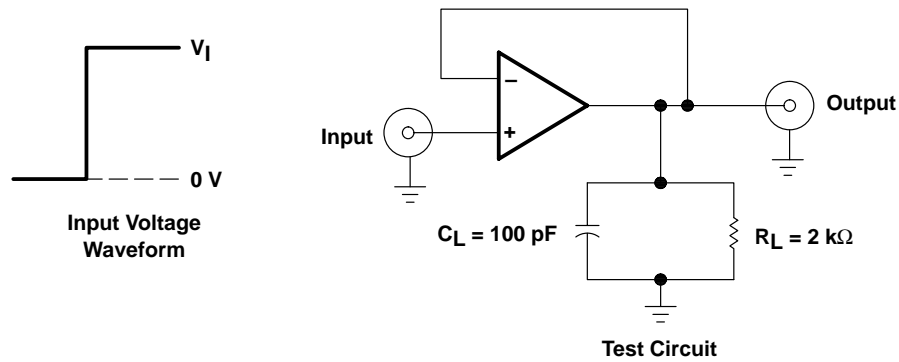


Figure 1. Rise-Time, Overshoot, and Slew-Rate Waveform and Test Circuit

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