HIGH PERFORMANCE OPERATIONAL AMPLIFIER MC1456/1556

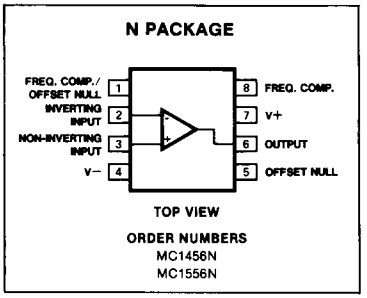
DESCRIPTION

The MC1456/1556 is an internally compensated precision monolithic operational amplifier featuring extremely low offset and bias currents and offset null capability. The MC1456/1556 is short circuit protected and its high common mode and differential input voltage range provides exceptional performance when used as an integrator, summing amplifier, and voltage follower.

FEATURES

- **Low input bias current—15nA maximum**
- **Low input offset current—2.0nA maximum**
- **Low input offset voltage—4.0mV maximum**
- **High slew rate—2.5V/μs typical**
- **Large power bandwidth—40kHz typical**
- **Low power consumption—45mW maximum**
- **Offset voltage null capability**
- **Output short circuit protection**
- **Input over-voltage protection**
- **MIL-STD-883A,B,C available**

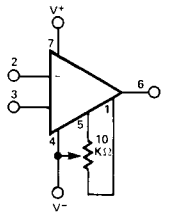
PIN CONFIGURATION



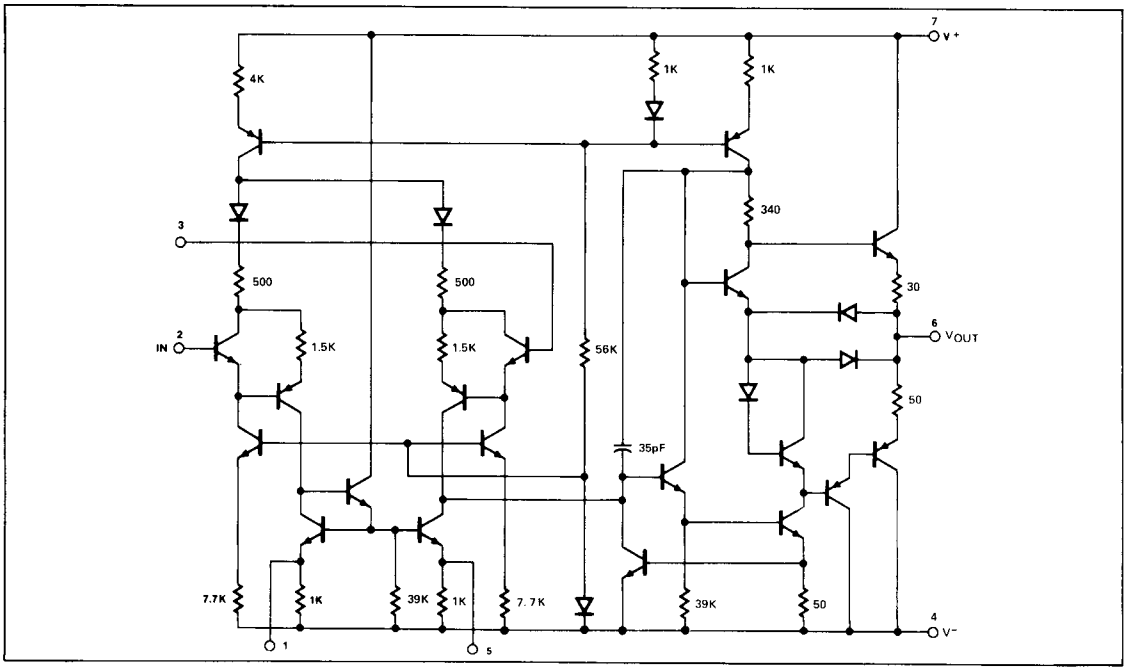
ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Power supply voltage MC1556	±22	V
MC1456	±18	V
Differential input voltage	± Vcc	V
Common mode input voltage	± Vcc	V
Load current	20	mA
Output short circuit duration	Continuous	
Power dissipation	680	mW
Derate above T_A = 25°C	4.6	mW/°C
Operating temperature range		
MC1556	-55 to +125	°C
MC1456	0 to +70	°C
Storage temperature range	-65 to +150	°C

OFFSET ADJUST CIRCUIT



EQUIVALENT SCHEMATIC



HIGH PERFORMANCE OPERATIONAL AMPLIFIER MC1456/1556

DC ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $V_S = \pm 15V$ unless otherwise specified

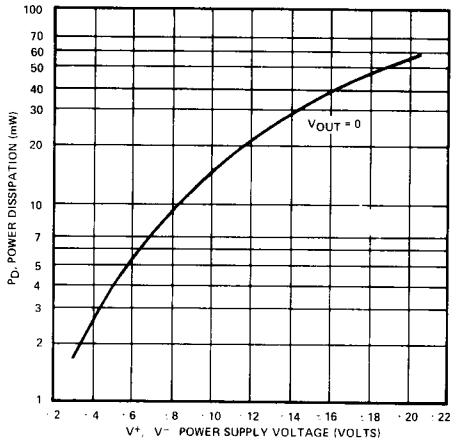
PARAMETER		TEST CONDITIONS	MC1556			MC1456			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage			2.0	4.0		5.0	10.0	mVdc
		Over temperature			6.0			14.0	mVdc
I_{OS}	Offset current			1.0	2.0		5.0	10.0	nA
		$0°C \le T_A \le 70°C$						14	nA
		$25°C \le T_A \le 125°C$			3.0				nA
		$-55°C \le T_A \le 25°C$			5.0				nA
I_{BIAS}	Input current			8.0	15		15.0	30.0	nA
		Over temperature			30			40	nA
V_{CM}	Common mode voltage range		±12	±13		±11	±12		V
CMRR	Common mode rejection ratio	$R_S \le 10k\Omega$, $T_A = 25°C$, f = 100Hz	80	110		70	110		dB
Z_{IN}	Common mode input impedance	f = 20Hz		250			250		MΩ
V_{OUT}	Output voltage swing	$R_L = 2k\Omega$	±12	±13		±11	±12		V
I_{CC}	Supply current			1.0	1.5		1.3	3.0	mA
P_D	DC quiescent power dissipation ($V_O = 0$)			30	45		40	90	mW
PSRR	Supply voltage rejection ratio	$R_S \le 10k\Omega$		50	100		75	200	μV/V
	Large signal voltage gain	$R_L \le 2k\Omega$, $V_{OUT} = \pm 10V$, $T_A = 25°C$	100	200		70	100		V/mV
		Over temperature	40			40			V/mV

AC ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $V_S = \pm 15V$ unless otherwise specified.

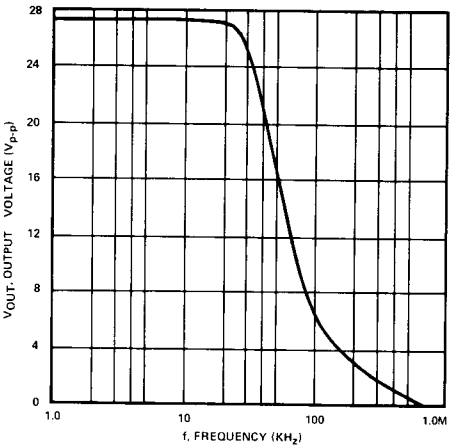
PARAMETER		TEST CONDITIONS	MC1556			MC1456			UNIT
			Min	Typ	Max	Min	Typ	Max	
	Differential input impedance								
c_p	Parallel input capacitance	Open loop f = 20Hz		6.0			6.0		pF
r_p	Parallel input resistance			5			3		MΩ
e_n	Equivalent input noise voltage	$A_V = 100$, $R_S = 10k\Omega$, f = 1.0kHz, BW = 1.0kHz		45			45		$nV/\sqrt{Hz}$
BW_p	Power bandwidth	$A_V = 1$, $R_L = 2k\Omega$, THD ≤ 5%							
		$V_{OUT} = \pm 10V$		40			40		kHz
	Phase margin (open loop, unity gain)			70			70		degrees
	Gain margin			18			18		dB
S_R	Slew rate (unity gain)			2.5			2.5		V/μsec
Z_{OUT}	Output impedance	f = 20Hz		1.0	2.0		1.0	2.5	kΩ
BW	Unity gain crossover frequency (open loop)			1.0			1.0		MHz

TYPICAL PERFORMANCE CHARACTERISTICS

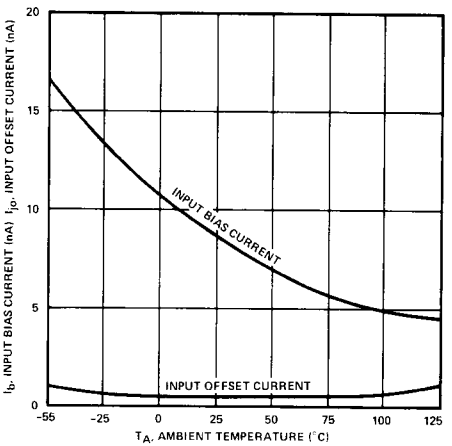
POWER DISSIPATION vs POWER SUPPLY VOLTAGE



POWER BANDWIDTH



TYPICAL INPUT BIAS CURRENT AND INPUT OFFSET CURRENT vs TEMPERATURE FOR MC1556



VOLTAGE FOLLOWER PULSE RESPONSE