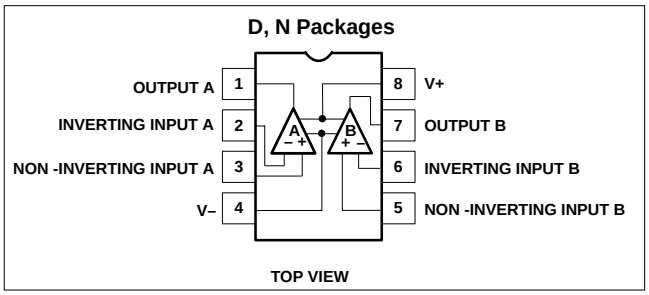
General purpose operational amplifier MC/SA1458/MC1558

DESCRIPTION

The MC1458 is a high-performance operational amplifier with high open-loop gain, internal compensation, high common-mode range and exceptional temperature stability. The MC1458 is short-circuit protected.

The MC1458/SA1458/MC1558 consists of a pair of 741 operational amplifiers on a single chip.

PIN CONFIGURATION



FEATURES

- Internal frequency compensation
- Short-circuit protection
- Excellent temperature stability
- High input voltage range
- No latch-up
- 1558/1458 are 2 “op amps” in space of one 741 package

ORDERING INFORMATION

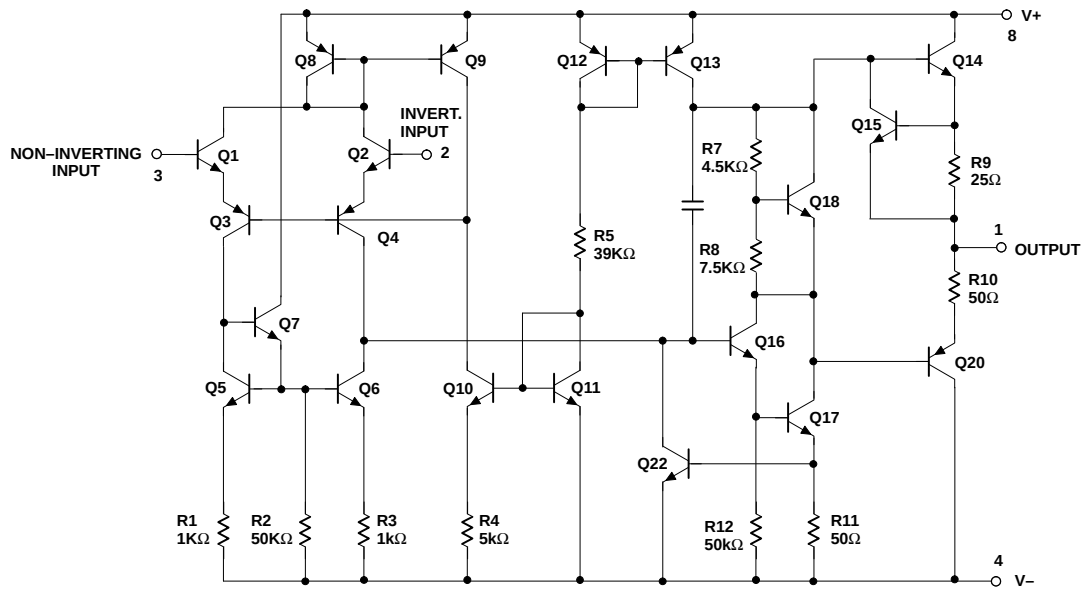
DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
8-Pin Plastic Small Outline (SO) Package	0 to +70°C	MC1458D	0174C
8-Pin Plastic Dual In-Line Package (DIP)	0 to +70°C	MC1458N	0404B
8-Pin Plastic Small Outline (SO) Package	-40°C to +85°C	SA1458D	0174C
8-Pin Plastic Dual In-Line Package (DIP)	-40°C to +85°C	SA1458N	0404B
8-Pin Plastic Dual In-Line Package (DIP)	-55°C to +125°C	MC1558N	0404B

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_S	Supply voltage		
	MC1458	±18	V
	SA1458	±18	V
	MC1558	±22	V
T_J	Junction temperature	+150	°C
$P_{D\ MAX}$	Maximum power dissipation, T_A=25°C (still-air)[1]		
	N package	1160	mW
	D package	780	mW
V_{DIFF}	Differential input voltage	±30	V
V_{IN}	Input voltage[2]	±15	V
	Output short-circuit duration	Continuous	
T_A	Operating ambient temperature range		
	MC1458	0 to +70	°C
	SA1458	-40 to +85	°C
	MC1558	-55 to +125	°C
T_{STG}	Storage temperature range	-65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	300	°C

NOTES:
1. The following derating factors should be applied above 25°C; N package at 9.3mW/°C; D package at 6.2mW/°C
2. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

EQUIVALENT SCHEMATIC



Amplifier "A" of MC1458, SA1458, MC1558

DC ELECTRICAL CHARACTERISTICS

T_A=25°C, V_S=±15V, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	MC1558			UNIT
			Min	Typ	Max	
V_{OS}	Offset voltage	R_S=10kΩ		1.0	5.0	mV
		R_S=10kΩ, over temperature			6.0	mV
ΔV_{OS}	Offset voltage	Over temperature		10		µV/°C
I_{OS}	Offset current			20	200	nA
		Over temperature			500	nA
ΔI_{OS}	Offset current	Over temperature		0.10		nA/°C
I_{BIAS}	Input bias current			80	500	nA
		Over temperature			1500	nA
ΔI_{BIAS}	Bias current	Over temperature		1.0		nA/°C
V_{OUT}	Output voltage swing	R_L=10kΩ, over temperature	±12	±14		V
		R_L=2kΩ, over temperature	±10	±13		
A_{VOL}	Large-signal voltage gain	R_L=2kΩ,V_O=±10V	50	100		V/mV
		R_L=2kΩ, V_O=± temperature	20			
	Offset voltage adjustment range			±30		mV
PSRR	Power supply rejection ratio	R_S≤10kΩ		30	150	µV/V
CMRR	Common mode rejection ratio		70	90		dB
I_{CC}	Supply current			2.3	5.0	mA
V_{IN}	Input voltage range		±12	±13		V
P_D	Power consumption			70	150	mW
	Channel separation			120		dB
R_{OUT}	Output resistance			75		Ω
I_{SC}	Output short-circuit current		10	25	60	mA

DC ELECTRICAL CHARACTERISTICS (Continued)

T_A=25°C V_{CC}=±15V, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	MC1458			SA1458			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage	R_S=10kΩ		2.0	6.0		2.0	6.0	mV
		R_S=10kΩ, over temp.			7.5			7.5	mV
ΔV_{OS}	Offset voltage	Over temperature		12			12		µV/°C
I_{OS}	Offset current			20	200		20	200	nA
		Over temperature			300			500	nA
ΔI_{OS}	Offset current	Over temperature		0.10			0.10		nA/°C
I_{BIAS}	Input bias current			80	500		80	500	nA
		Over temperature			800			1500	nA
ΔI_{BIAS}	Bias current	Over temperature		1.0			1.0		nA/°C
V_{OUT}	Output voltage swing	R_L=10kΩ, over temp.	±12	±14		±12	±14		V
		R_L=2kΩ, over temp.	±10	±13		±10	±13		
A_{VOL}	Large-signal voltage gain	R_L=2kΩ, V_O=±10V	25	200		20	200		V/mV
		R_L=2kΩ, V_O=±10V, Over temperature	15			15			V/mV
	Offset voltage adjustment range			±30			±30		mV
PSRR	Power supply rejection ratio	R_S≤10kΩ		30	150		30	150	µV/V
CMRR	Common-mode rejection ratio		70	90		70	90		dB
I_{CC}	Supply current			2.3	5.6		2.3	5.6	mA
V_{IN}	Input voltage range		±12	±13		±12	±13		V
R_{IN}	Input resistance		0.3	1		0.3	1		MΩ
P_D	Power consumption			70	170		70	170	mW
	Channel separation			120			120		dB
I_{SC}	Output short-circuit current			25			25		mA

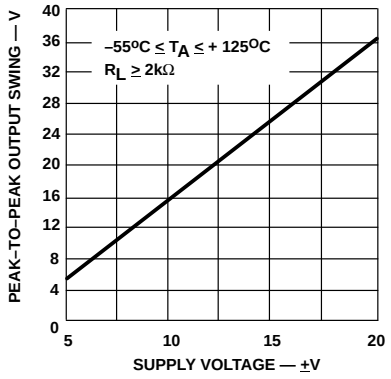
AC ELECTRICAL CHARACTERISTICS

T_A=25°C V_S=±15V, unless otherwise specified.

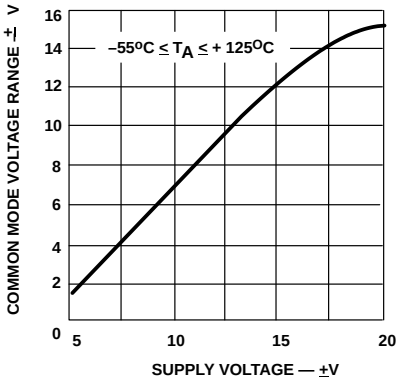
SYMBOL	PARAMETER	TEST CONDITIONS	MC1458, SA1458, MC1558			UNIT
			Min	Typ	Max	
R_{IN}	Parallel input resistance	Open-loop, f=20Hz	0.3			MΩ
	Common-mode input impedance	f=20Hz		200		MΩ
	Equivalent input noise voltage	A_V=100, R_S=10kΩ, BW=1.0kHz, f=1.0kHz		30		$nV/\sqrt{Hz}$
BW	Power bandwidth	A_V=1, R_L=2.0kΩ, THD≤5%, V_{OUT}=20V_{P-P}		14		kHz
	Phase margin			65		degrees
A_V	Gain margin			11		dB
	Unity gain crossover frequency	Open loop		1.0		MHz
	Transient response unity gain	V_{IN}=20mV, R_L=2kΩ, C_L≤100pF				
t_R	Rise time			0.3		µs
	Overshoot			5.0		%
SR	Slew rate	C_L≤100pF, R_L≥2kΩ, V_{IN}=±10V		0.8		V/µs

TYPICAL PERFORMANCE CHARACTERISTICS

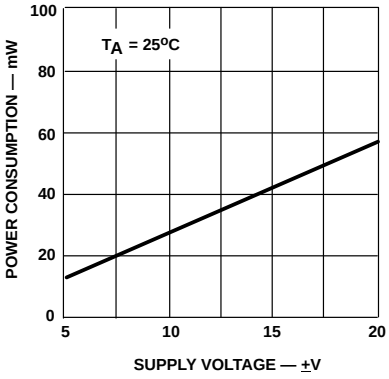
Output Voltage Swing as a Function of Supply Voltage



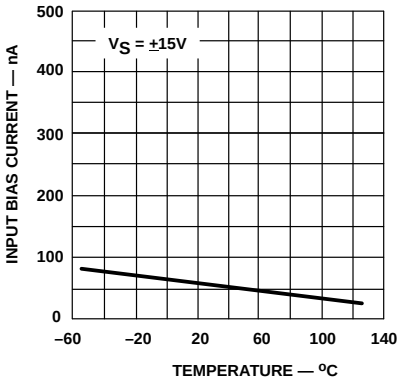
Input Common–Mode Range as a Function of Supply Voltage



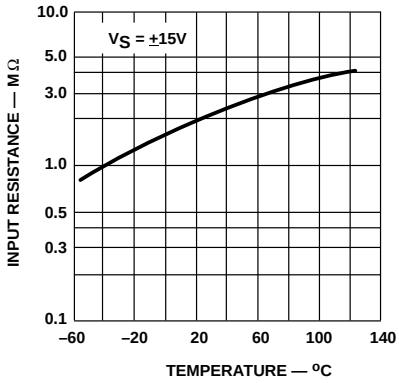
Power Consumption as a Function of Supply Voltage



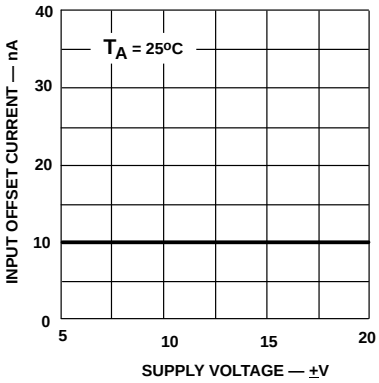
Input Bias Current as a Function Of Ambient Temperature



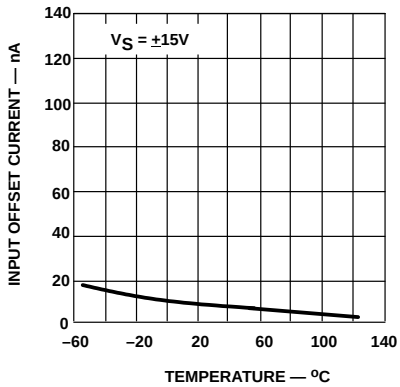
Input Resistance as a Function of Ambient Temperature



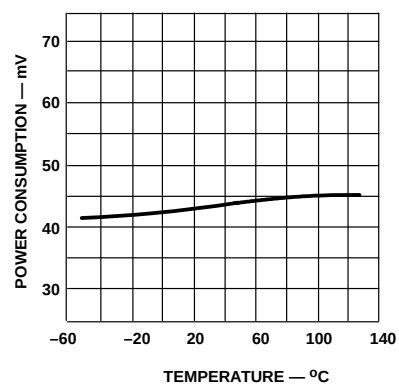
Input Offset Current as a Function of Supply Voltage



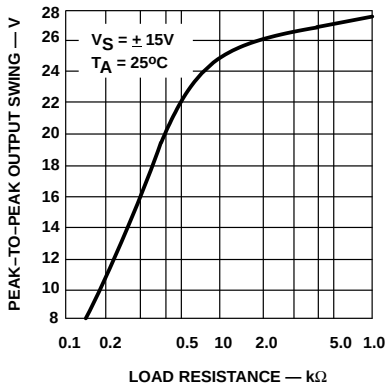
Input Offset Current as a Function of Ambient Temperature



Power Consumption as a Function of Ambient Temperature

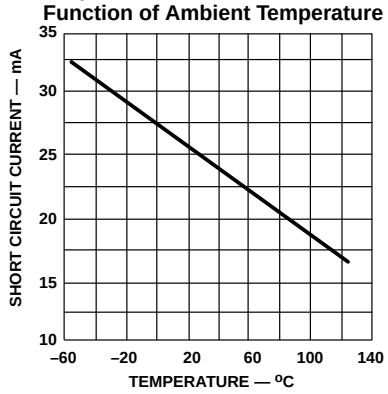


Output Voltage Swing as a Function of Load Resistance

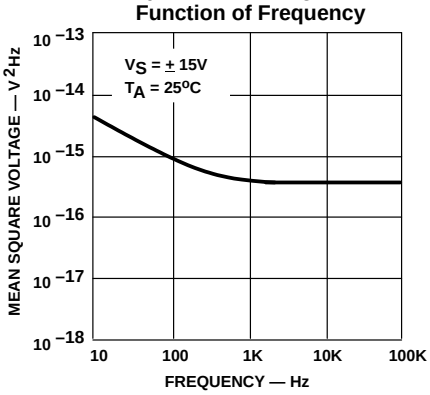


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

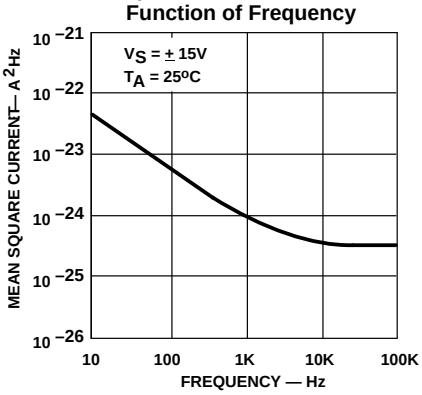
Output Short–Circuit Current as a Function of Ambient Temperature



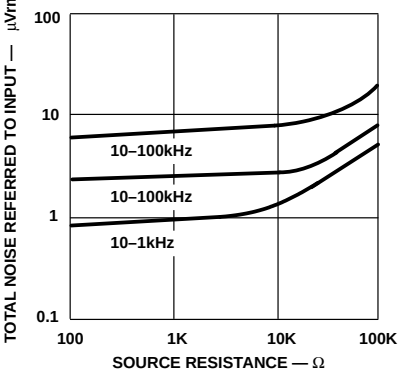
Input Noise Voltage as a Function of Frequency



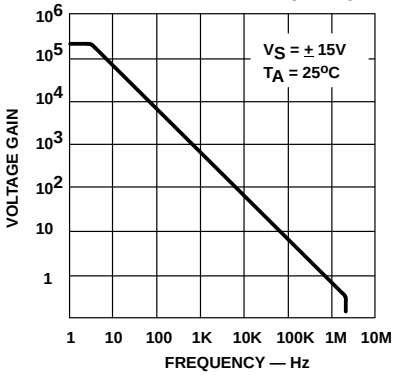
Input Noise Current as a Function of Frequency



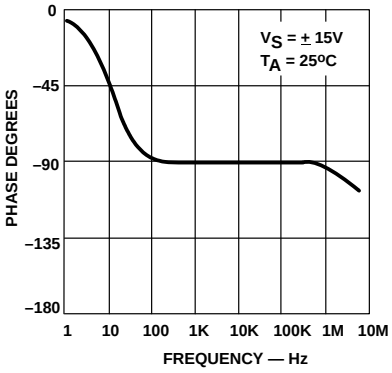
Broadband Noise for Various Bandwidths



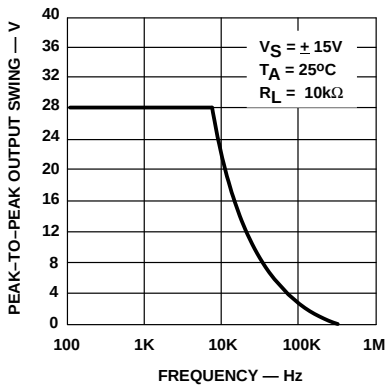
Open–Looped Voltage Gain as a Function of Frequency



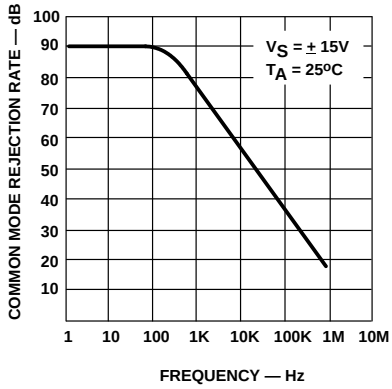
Open-Looped Phase Response as a Function of Frequency



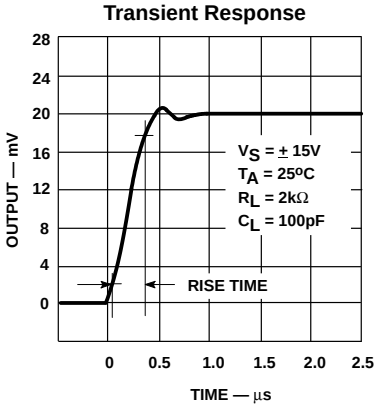
Output Voltage Swing as a Function of Frequency



Common–Mode Rejection Ratio as a Function of Frequency



Transient Response



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)