MC4558

Wide bandwidth dual bipolar operational amplifier

Datasheet – production data

Features

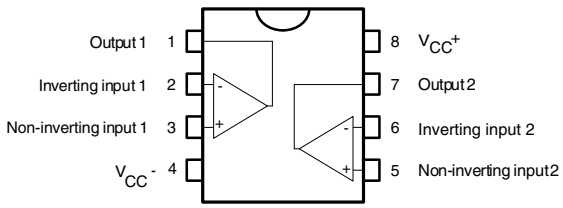
- Internally compensated
- Short-circuit protection
- Gain and phase match between amplifier
- Low power consumption
- Pin-to-pin compatible with MC1458/LM358
- Gain bandwidth (at 100 kHz): 5.5 MHz

N
DIP8
(Plastic package)

D
SO-8
(Plastic micropackage)

P
TSSOP8
(Thin shrink small outline package)

Pin connections (top view)



Description

The MC4558 is a high performance monolithic dual operational amplifier.

The circuit combines all of the outstanding features of the MC1458, and in addition possesses three times the unity gain bandwidth of the industry standard.

Table 1. Device summary

Order codes	Temperature range	Package	Packing	Marking
MC4558CN	0 °C to +70 °C	DIP8	Tube	MC4558CN
MC4558CD/CDT		SO-8	Tube or tape & reel	4558C
MC4558CPT		TSSOP8	Tape & reel	
MC4558ID/IDT	-40 °C to +105 °C	SO-8	Tube or tape & reel	4558I

This is information on a product in full production.

1 Absolute maximum ratings

Table 2. Key parameters and their absolute maximum ratings

Symbol	Parameter	MC4558I	MC4558C	Unit
V_{CC}	Supply voltage	±22		V
V_i(1)	Input voltage	±15		V
V_{id}(2)	Differential input voltage	±30		V
P_{tot}	Power dissipation	680		mW
	Output short-circuit duration	Infinite		
T_{oper}	Operating free-air temperature range	-40 to +105	0 to +70	°C
R_{thja}	Thermal resistance junction-to-ambient: SO-8 TSSOP8 DIP8	125 120 85		°C/W
ESD	HBM: Human body model(3)	500		V
	MM: Machine model(4)	200		
	CDM: Charged device model	1500		

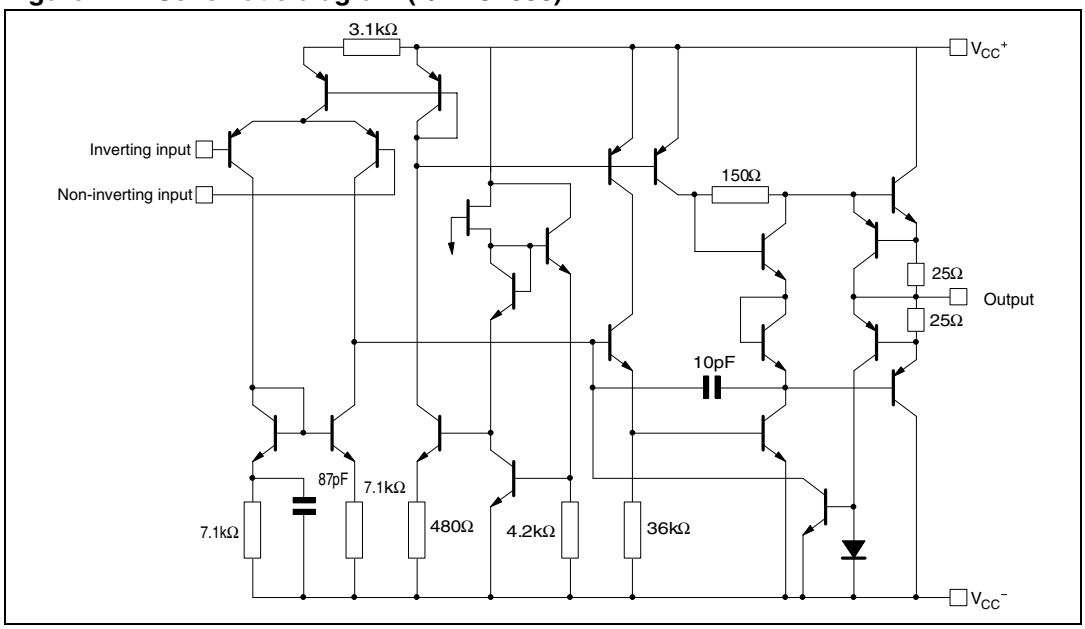
1. Input voltage is with respect to the midpoint between Vcc+ and Vcc-. Its value must never exceed 15 V or the magnitude of Vcc, whichever is less.
2. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
3. Human body model, 100 pF discharged through a 1.5 kΩ resistor into pin of device.
4. Machine model ESD, a 200 pF cap is charged to the specified voltage, then discharged directly into the IC with no external series resistor (internal resistor < 5 Ω), into pin of device.

Table 3. Operating conditions

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	±2	±20	V

2 Typical application schematic

Figure 1. Schematic diagram (1/2MC4558)



3 Electrical characteristics

Table 4. Electrical characteristics for V_{CC} = ±15 V, T_{amb} = 25 °C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input offset voltage (R_s ≤10kΩ) T_{amb} = +25°C $T_{min.}$ ≤T_{amb} ≤$T_{max.}$		1	5 6	mV
I_{io}	Input offset current T_{amb} = +25°C $T_{min.}$ ≤T_{amb} ≤$T_{max.}$		20	100 200	nA
I_{ib}	Input bias current T_{amb} = +25°C $T_{min.}$ ≤T_{amb} ≤$T_{max.}$		50	400 500	nA
A_{vd}	Large signal voltage gain (R_L = 2kΩ, V_o = ±10V) T_{amb} = +25°C $T_{min.}$ ≤T_{amb} ≤$T_{max.}$	50 25	200		V/mV
SVR	Supply voltage rejection ratio (R_s ≤10kΩ) T_{amb} = +25°C $T_{min.}$ ≤T_{amb} ≤$T_{max.}$	77 77	90		dB
I_{CC}	Supply current, all amplifiers, no load T_{amb} = +25°C $T_{min.}$ ≤T_{amb} ≤$T_{max.}$		2.3	4.5 6	mA
V_{icm}	Input common mode voltage range T_{amb} = +25°C $T_{min.}$ ≤T_{amb} ≤$T_{max.}$	±12 ±12			V
CMR	Common-mode rejection ratio (R_s ≤10kΩ) T_{amb} = +25°C $T_{min.}$ ≤T_{amb} ≤$T_{max.}$	70 70	90		dB
I_{os}	Output short-circuit current	10	20	40	mA
V_o	Output voltage swing T_{amb} = +25°C R_L = 10kΩ R_L = 2kΩ $T_{min.}$ ≤T_{amb} ≤$T_{max.}$ R_L = 10kΩ R_L = 2kΩ	±12 ±10 ±12 ±10	±14 ±13		V
SR	Slew rate V_i = ±10, R_L = 2kΩ, C_L = 100pF, T_{amb} = 25°C, unity gain	1.5	2.2		V/µs
t_r	Rise time V_i = ±20mV, R_L = 2kΩ, C_L = 100pF, T_{amb} = 25°C, unity gain		0.3		µs
K_{OV}	Overshoot V_i = ±20mV, R_L = 2kΩ, C_L = 100pF, T_{amb} = 25°C, unity gain		15		%
R_i	Input resistance	0.3	2		MΩ
C_i	Input capacitance		1.4		pF
R_o	Output resistance		75		Ω
B	Unity gain bandwidth		2.8		MHz

Table 4. Electrical characteristics for V_{CC} = ±15 V, T_{amb} = 25 °C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
GBP	Gain bandwidth product V_i = 10mV, R_L = 2kΩ, C_L = 100pF, f = 100kHz, T_{amb} = 25°C		5.5		MHz
THD	Total harmonic distortion f = 1kHz, A_v = 20dB, R_L = 2kΩ, V_o = $2V_{pp}$, C_L = 100pF, T_{amb} = 25°C		0.008		%
e_n	Equivalent input noise voltage (R_S = 100Ω, f = 1kHz)		12		$\frac{nV}{\sqrt{Hz}}$
V_{O1}/V_{O2}	Channel separation		120		dB

Figure 2. Transient response test circuit

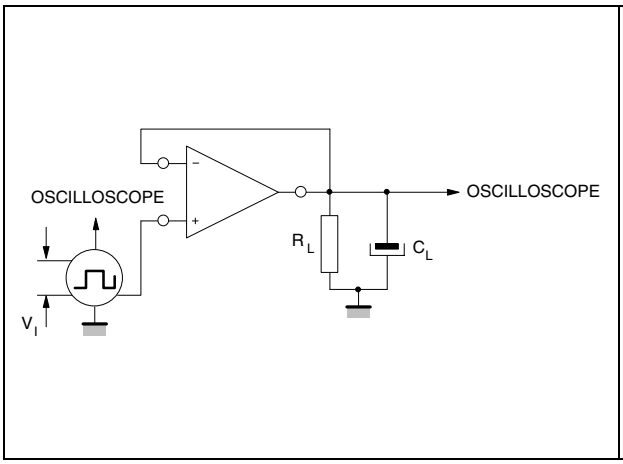


Figure 3. Positive output voltage swing vs. load resistance

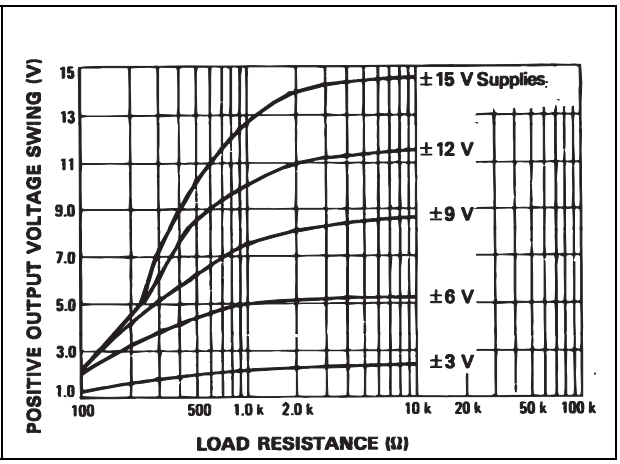


Figure 4. Open loop frequency response

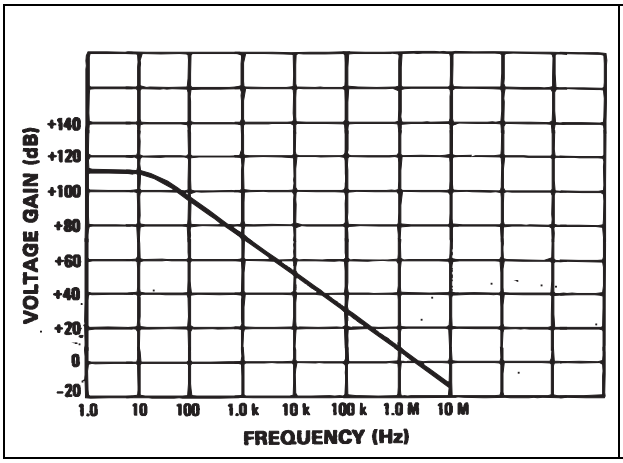


Figure 5. Negative output voltage swing vs. load resistance

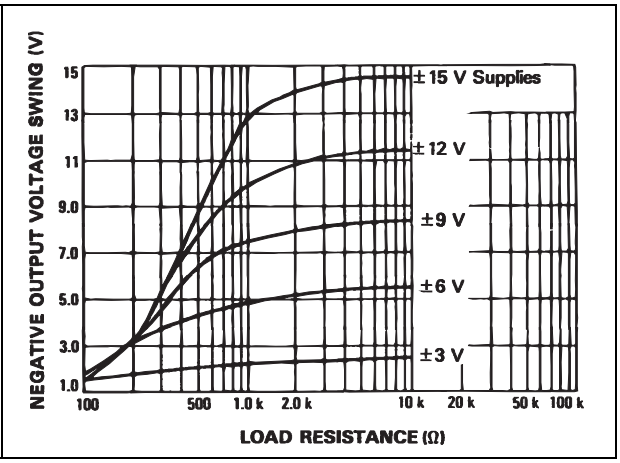


Figure 6. Phase margin vs. frequency

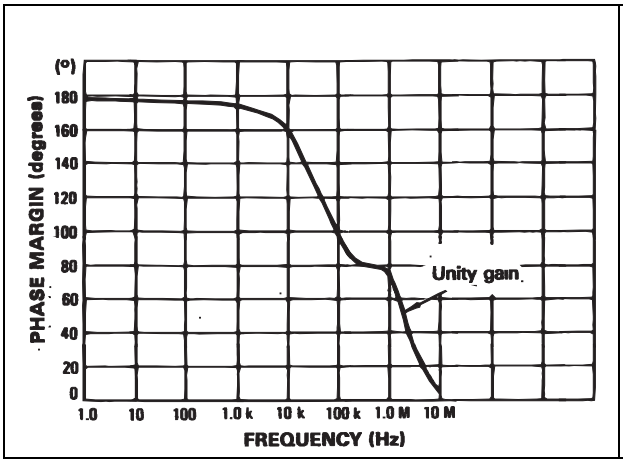
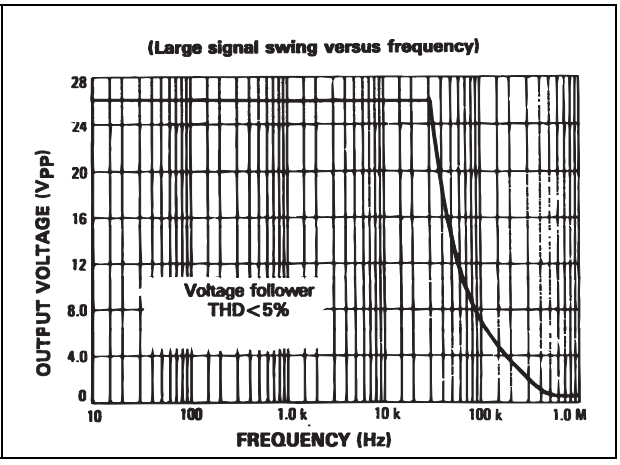


Figure 7. Power bandwidth



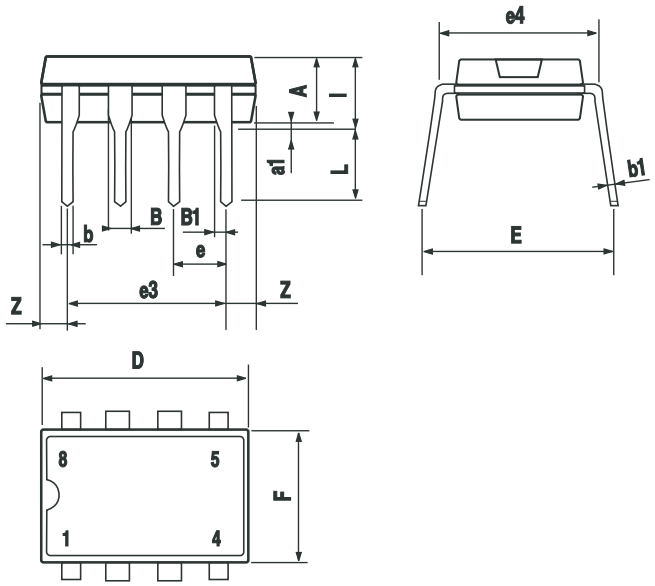
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Figure 8. DIP8 package

Plastic DIP-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063

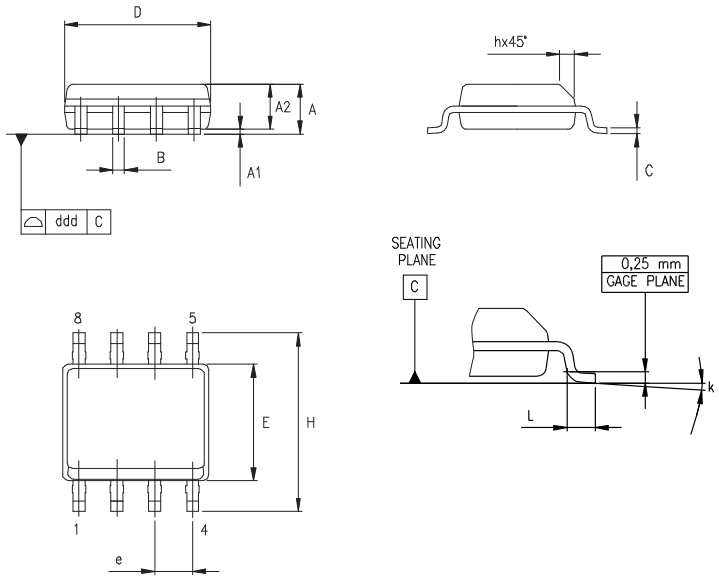


P001F

Figure 9. SO-8 package

SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
k	8° (max.)					
ddd			0.1			0.04

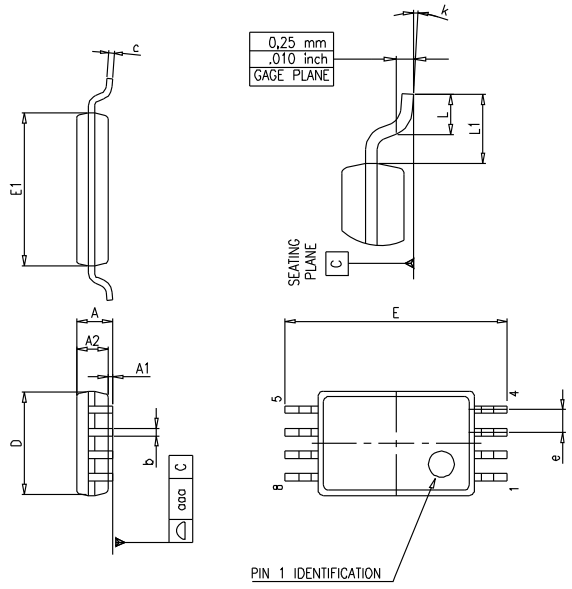


0016023/C

Figure 10. TSSOP8 package

TSSOP8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002		0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.008
D	2.90	3.00	3.10	0.114	0.118	0.122
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.177
e		0.65			0.0256	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030
L1		1			0.039	



5 Revision history

Table 5. Document revision history

Date	Revision	Changes
Oct-2001	1	Initial release.
Oct-2005	2	The following changes were made in this revision: – *Table 3.: Operating conditions on page 2* updated with Vcc min. and max. – Addition of supplementary data in *Table 2.: Key parameters and their absolute maximum ratings on page 2* Minor grammatical and formatting changes throughout.
13-Apr-2012	3	– ESD MM changed from 500 V to 200 V in *Table 2: Key parameters and their absolute maximum ratings* – Order codes MC4558IN and MC4558IPT removed from *Table 1.: Device summary* – Minor text and formatting changes throughout.

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