

## Wide bandwidth dual bipolar operational amplifier

Datasheet — production data

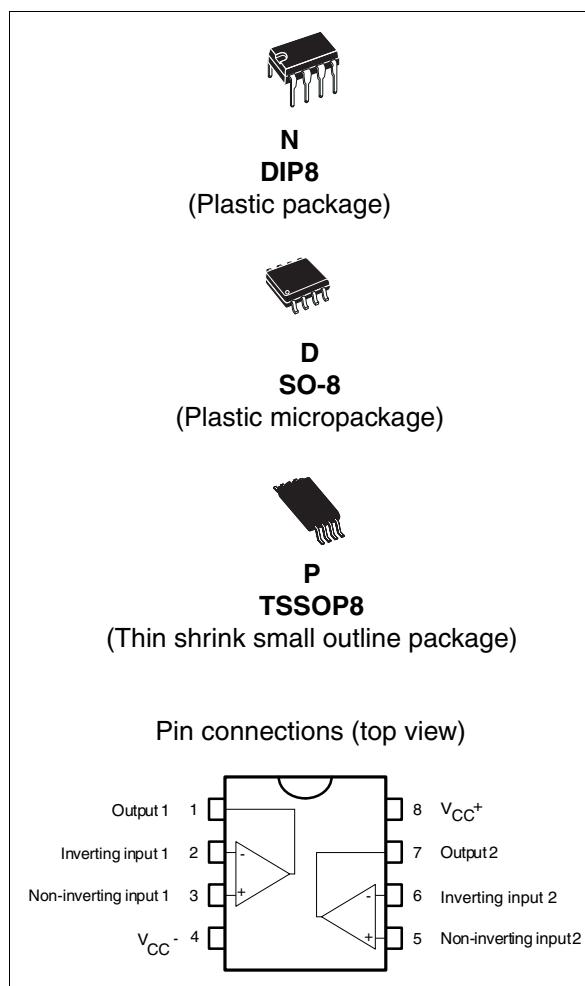
### Features

- 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

### 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

# 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:			°C/W
	SO-8	125		
	TSSOP8	120		
	DIP8	85		
ESD	HBM: Human body model <sup>(3)</sup>	500		V
	MM: Machine model <sup>(4)</sup>	200		
	CDM: Charged device model	1500		

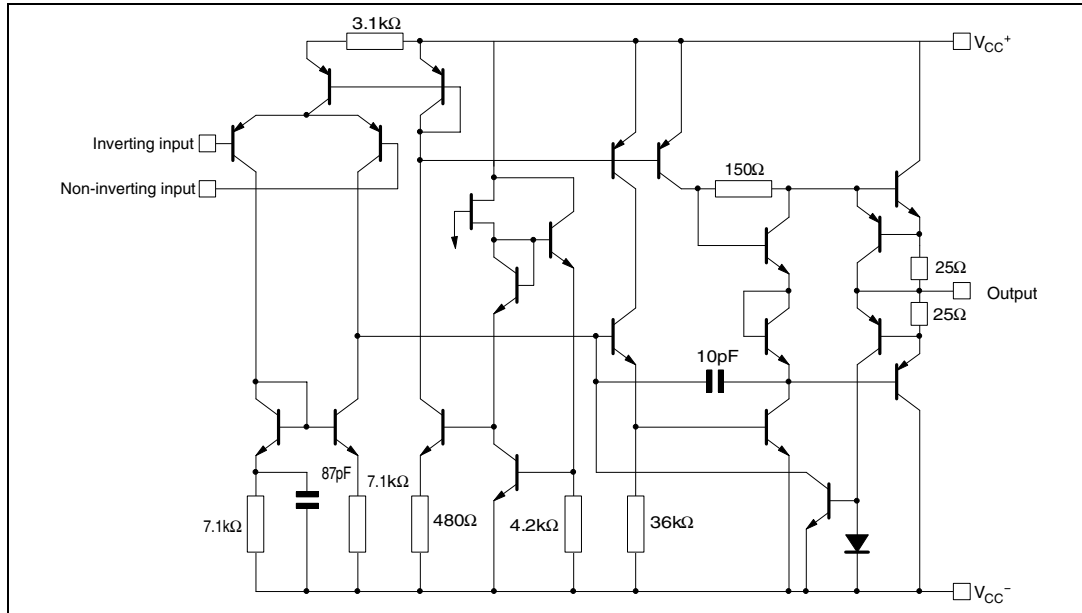
1. Input voltage is with respect to the midpoint between  $V_{cc+}$  and  $V_{cc-}$ . Its value must never exceed 15 V or the magnitude of  $V_{cc}$ , whichever is less.
2. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
3. Human body model, 100 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  $V_{CC} = \pm 15\text{ V}$ ,  $T_{amb} = 25\text{ }^\circ\text{C}$  (unless otherwise specified)**

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

Table 4. Electrical characteristics for  $V_{CC} = \pm 15\text{ V}$ ,  $T_{amb} = 25\text{ }^{\circ}\text{C}$  (unless otherwise specified)

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

Figure 2. Transient response test circuit

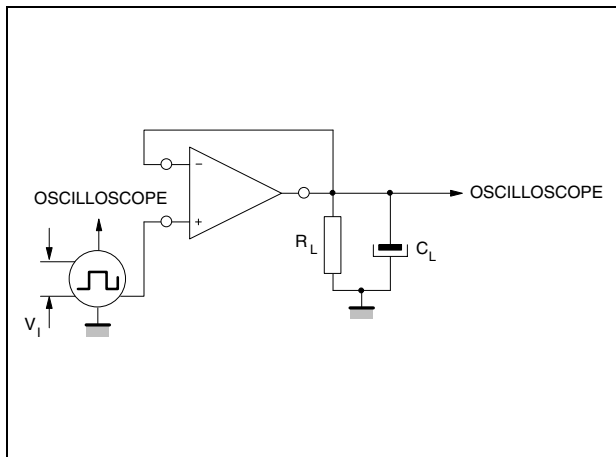


Figure 3. Positive output voltage swing vs. load resistance

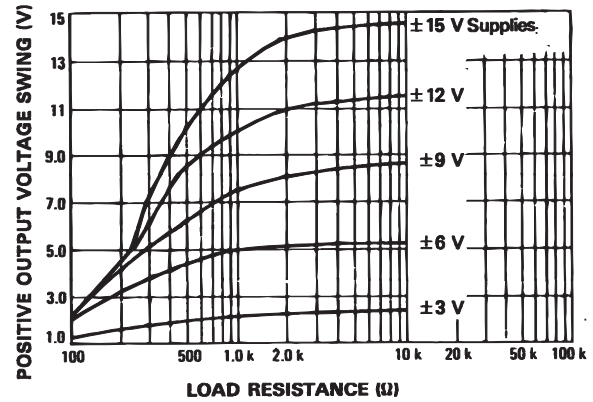


Figure 4. Open loop frequency response

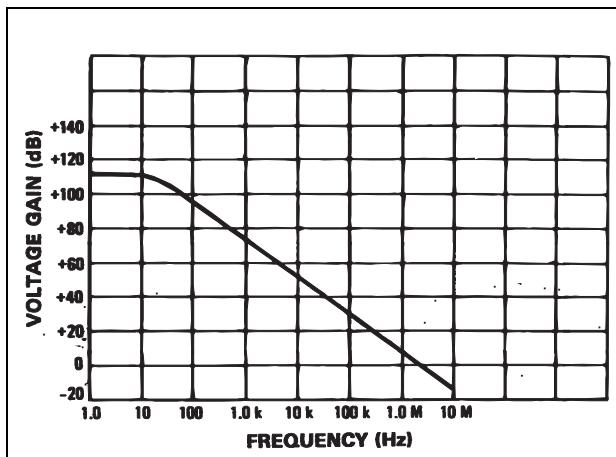


Figure 5. Negative output voltage swing vs. load resistance

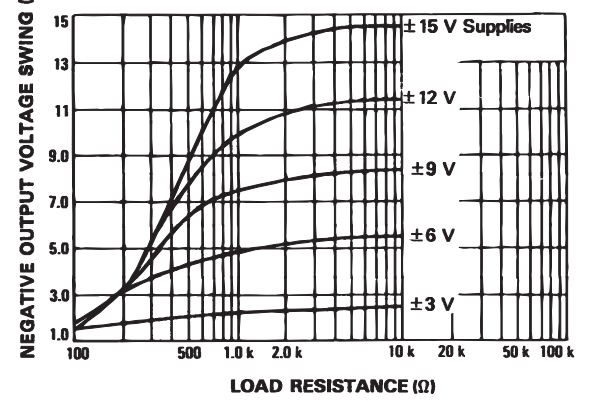


Figure 6. Phase margin vs. frequency

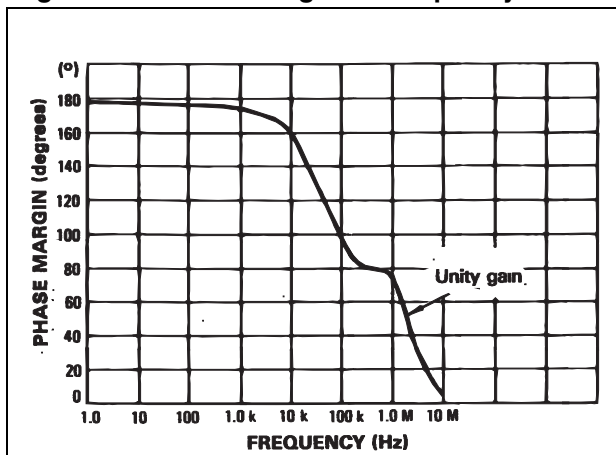
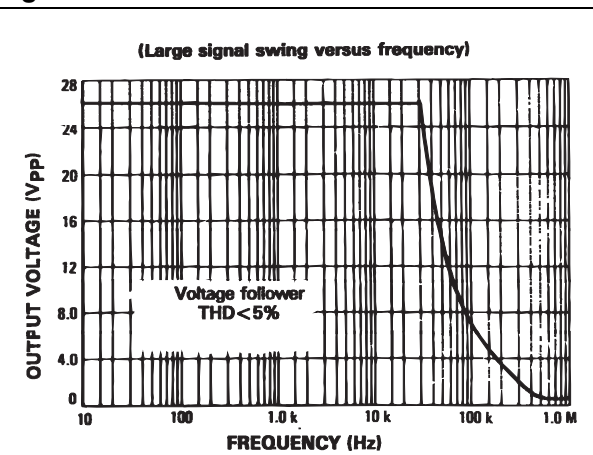


Figure 7. Power bandwidth



## 4 Package mechanical data

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Figure 8. DIP8 package

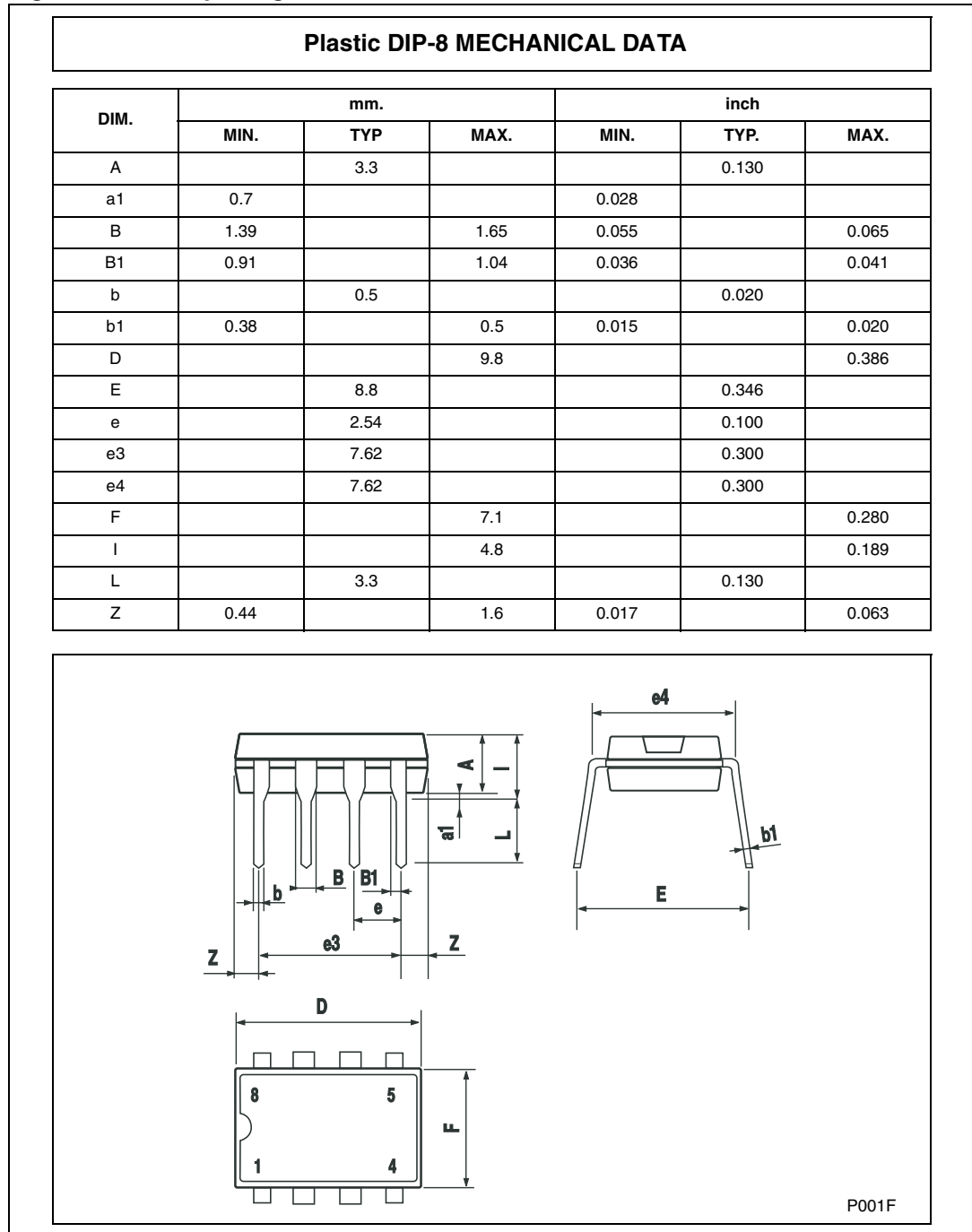
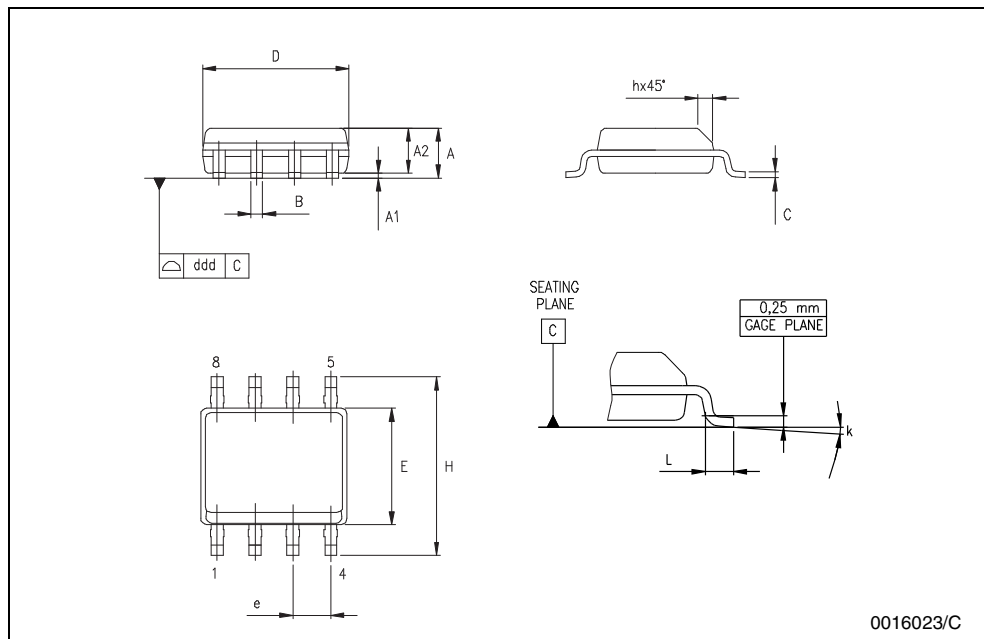


Figure 9. SO-8 package

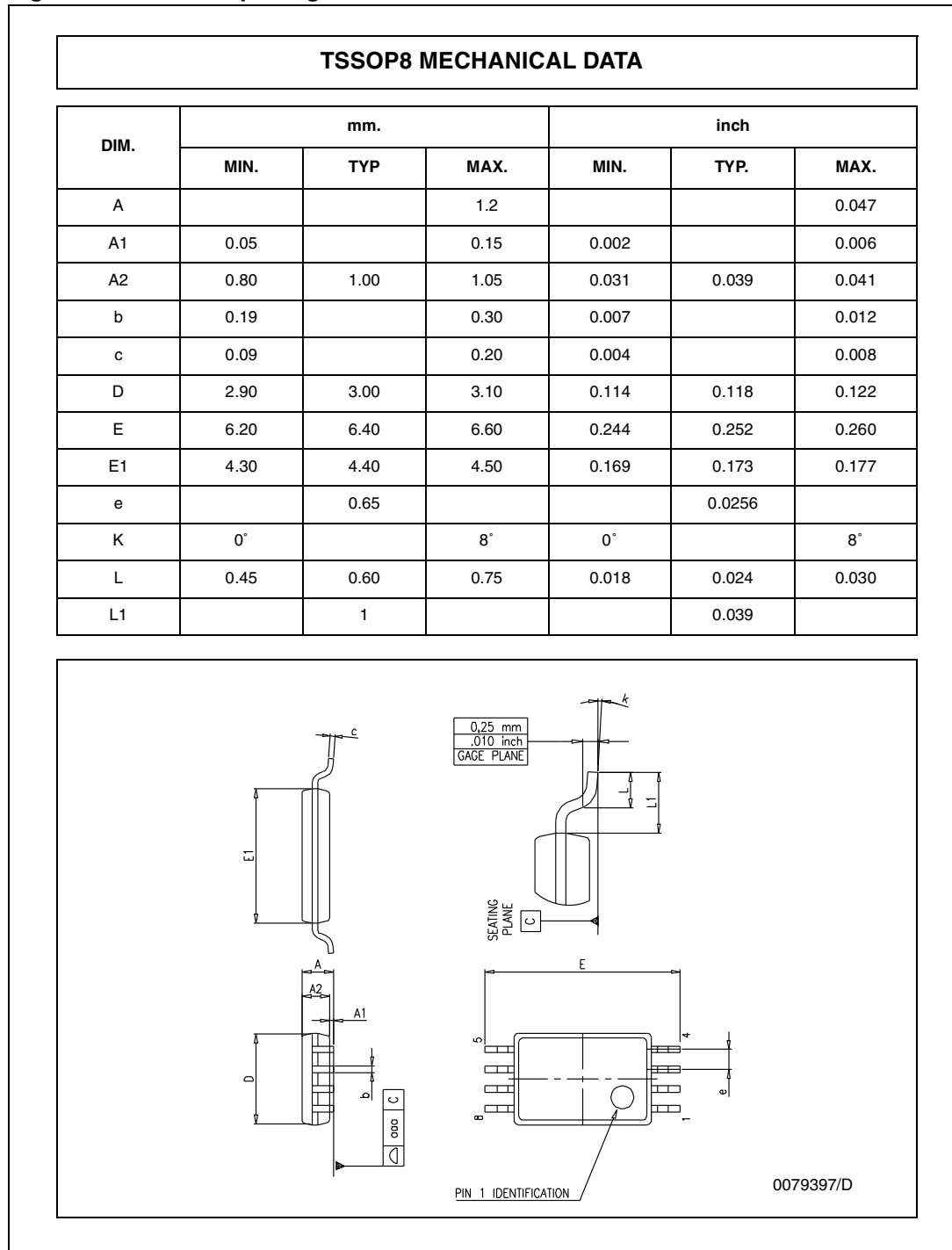
SO-8 MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
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



## 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: – <a href="#">Table 3.: Operating conditions on page 2</a> updated with Vcc min. and max. – Addition of supplementary data in <a href="#">Table 2.: Key parameters and their absolute maximum ratings on page 2</a> Minor grammatical and formatting changes throughout.
13-Apr-2012	3	– ESD MM changed from 500 V to 200 V in <a href="#">Table 2: Key parameters and their absolute maximum ratings</a> – Order codes MC4558IN and MC4558IPT removed from <a href="#">Table 1.: Device summary</a> – Minor text and formatting changes throughout.

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