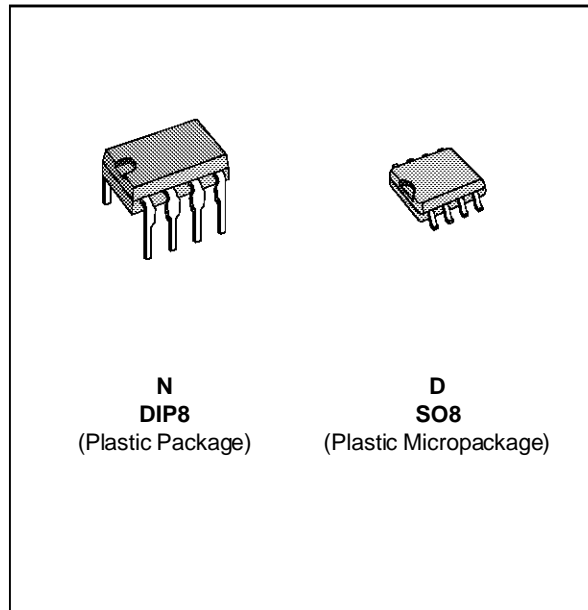


DUAL BIPOLAR OPERATIONAL AMPLIFIERS

- LOW DISTORTION RATIO
- LOW NOISE
- VERY LOW SUPPLY CURRENT
- LOW INPUT OFFSET CURRENT
- VERY LOW INPUT OFFSET VOLTAGE
- LARGE COMMON-MODE RANGE
- HIGH GAIN
- HIGH OUTPUT CURRENT
- GAIN-BANDWIDTH PRODUCT : 2.5MHz
- TEMPERATURE DRIFT : $2\mu\text{V}/^\circ\text{C}$
- LONG TERM STABILITY : $8\mu\text{V}/\text{YEAR}$
(for $T_{\text{amb}} \leq 50^\circ\text{C}$)



DESCRIPTION

The TEB1033, TEF1033 and TEC1033 are high performance dual-operational amplifiers intended for active filter applications. The internal phase compensation allows stable operation as voltage follower in spite of their high gain-bandwidth products. The circuits present very stable electrical characteristics over the entire supply voltage range.

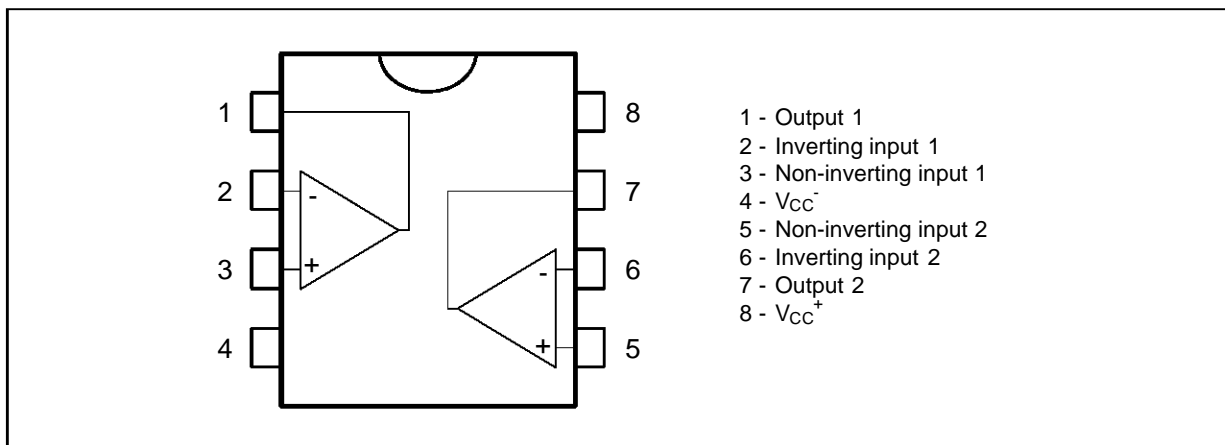
ORDER CODES

Part Number	Temperature Range	Package	
		N	D
TEB1033	$0^\circ\text{C}, +70^\circ\text{C}$	•	•
TEF1033	$-40^\circ\text{C}, +105^\circ\text{C}$	•	•
TEC1033	$-55^\circ\text{C}, +125^\circ\text{C}$	•	•

Example : TEB1033N

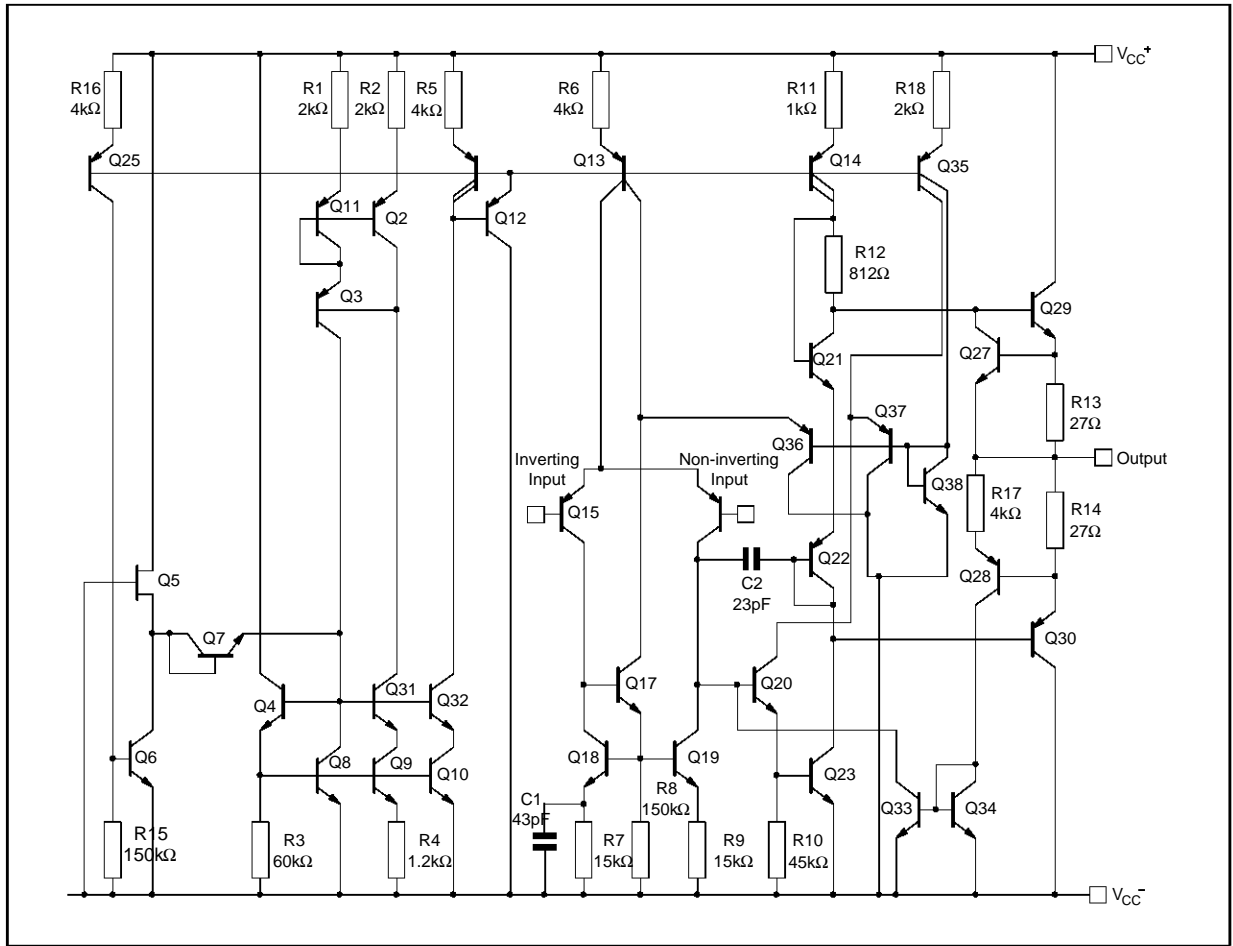
1033-01.TEL

PIN CONNECTIONS (top view)



TEB1033-TEF1033-TEC1033

BLOCK DIAGRAM (1/2 TEB1033)



1033-03.EPS

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit	
V _{CC}	Supply Voltage	± 18	V	
V _i	Input Voltage	± V _{CC}	V	
V _{id}	Differential Input Voltage	± (V _{CC} - 1)	V	
P _{tot}	Power Dissipation	D suffix N suffix	400 665	mW
T _{oper}	Operating Free-air Temperature Range	TEB1033 TEF1033 TEC1033	0 to +70 -40 to +105 -55 to +125	°C
T _{stg}	Storage Temperature Range		-65 to +150	°C

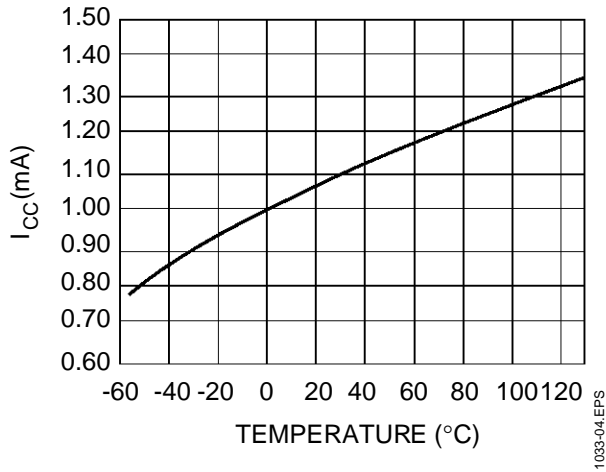
1033-02.TBL

ELECTRICAL CHARACTERISTICS $V_{CC} = \pm 15V$, $T_{amb} = +25^{\circ}C$ (unless otherwise specified)

Symbol	Parameter	TEB 1033 TEF 1033 TEC 1033			Unit
		Min.	Typ.	Max.	
V_{io}	Input Offset Voltage ($R_S \leq 10k\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		0.3	1 3	mV
DV_{io}	Input Offset Voltage Drift		2		$\mu V/^{\circ}C$
I_{io}	Input Offset Current $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		5	20 40	nA
I_{ib}	Input Bias Current $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		50	100 200	nA
A_{vd}	Large Signal Voltage Gain ($R_L = 2k\Omega$, $V_O = \pm 10V$) $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$	80 40	120		V/mV
SVR	Supply Voltage Rejection Ratio (DV_{CC} from $\pm 15V$ to $\pm 4V$) $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$	80 70	100		dB
I_{CC}	Supply Current, all Amp, no Load $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1	1.5 2	mA
V_{icm}	Input Common Mode Voltage Range $T_{amb} = 25^{\circ}C$	± 12			V
CMR	Common Mode Rejection Ratio ($R_S \leq 10k\Omega$, $V_{ic} = \pm 10V$) $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$	80 70	100		dB
I_{os}	Output Short-circuit Current $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$	10 10	23	40 40	mA
$\pm V_{opp}$	Output Voltage Swing $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$ $V_{CC} = \pm 4V$, $R_L = 2k\Omega$, $T_{amb} = 25^{\circ}C$ $V_{CC} = \pm 6V$, $R_L = 600\Omega$, $T_{amb} = 25^{\circ}C$		$R_L = 2k\Omega$ 13 12 2.8 3 $R_L = 2k\Omega$ 4.6		V
SR	Slew-rate ($V_I = \pm 10V$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain)	0.6	1		V/ μs
GBP	Gain Bandwidth Product ($f = 100kHz$, $T_{amb} = 25^{\circ}C$, $V_{in} = 10mV$, $R_L = 2k\Omega$, $C_L = 100pF$)	1.5	2		MHz
R_i	Input Resistance		1		M Ω
THD	Total Harmonic Distortion ($f = 1kHz$, $A_v = 20dB$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, $V_o = 2V_{pp}$)		0.008	0.05	%
e_n	Equivalent Input Noise Voltage ($f = 1kHz$) $R_S = 50\Omega$ $R_S = 1k\Omega$ $R_S = 10k\Omega$		8 10 18	15	$\frac{nV}{\sqrt{Hz}}$
V_{OPP}	Large Signal Voltage Swing $R_L = 10k\Omega$, $f = 10kHz$	26	28		V
ϕ_m	Phase Margin		45		Degrees
V_{o1}/V_{o2}	Channel Separation	100	120		dB

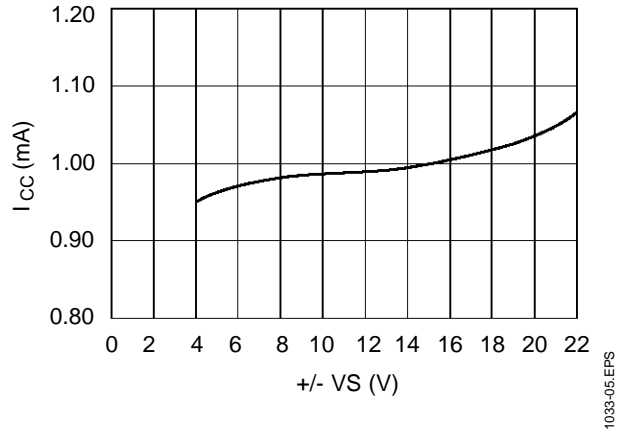
1033-03.TEL

SUPPLY CURRENT VERSUS AMBIENT TEMPERATURE



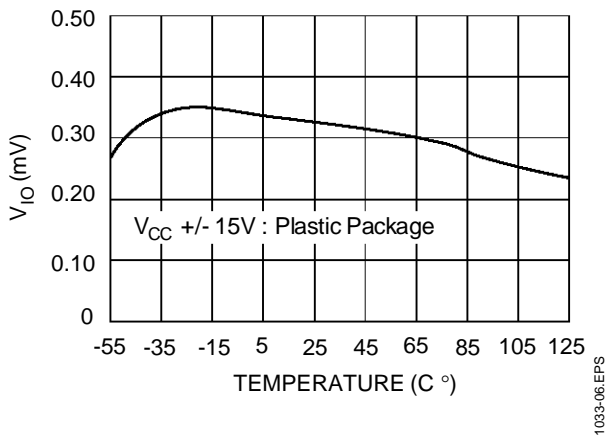
1033-04.EPS

SUPPLY CURRENT VERSUS SUPPLY VOLTAGE



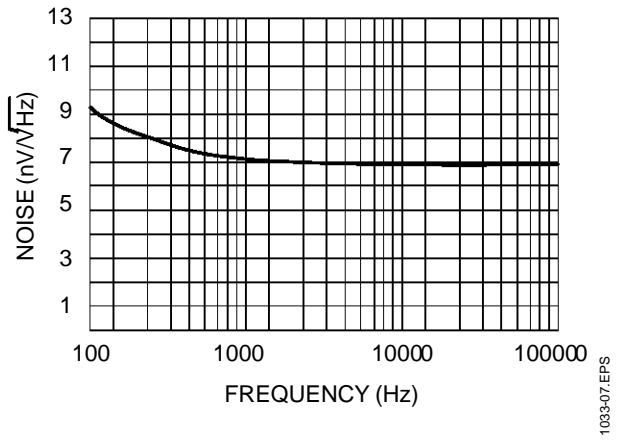
1033-05.EPS

OFFSET VOLTAGE VERSUS AMBIENT TEMPERATURE



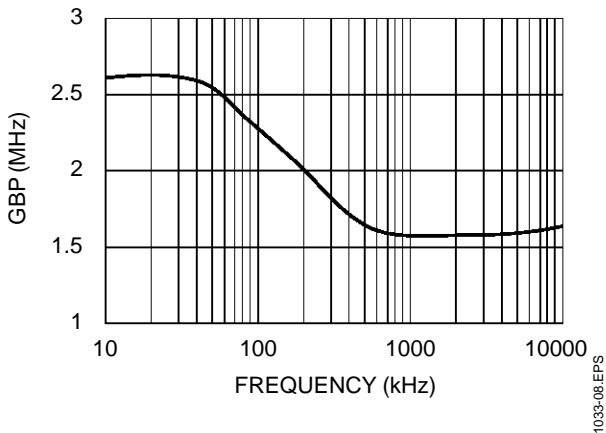
1033-06.EPS

TOTAL INPUT NOISE VERSUS FREQUENCY



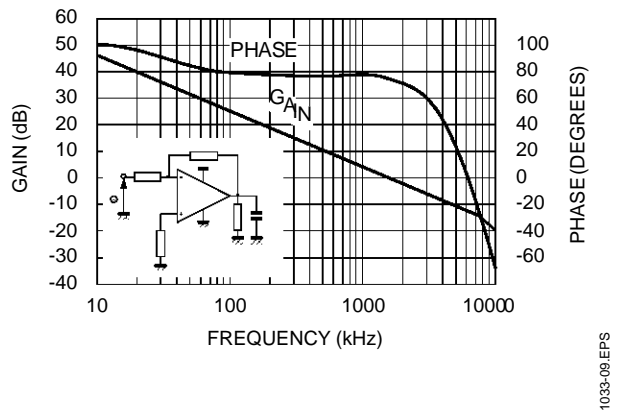
1033-07.EPS

GAIN BANDWIDTH PRODUCT VERSUS FREQUENCY



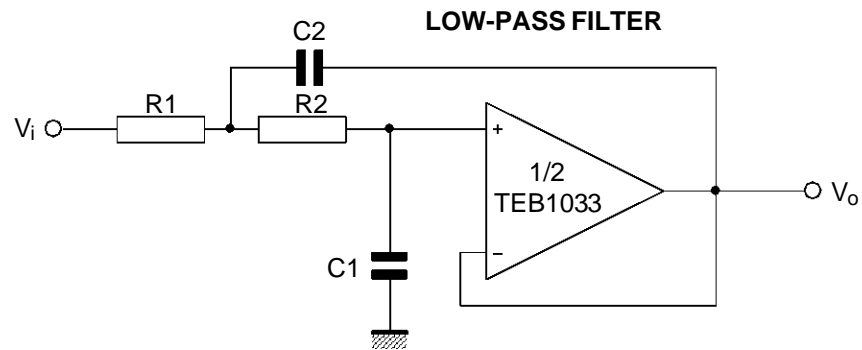
1033-08.EPS

DODE PLOT



1033-09.EPS

TYPICAL APPLICATION



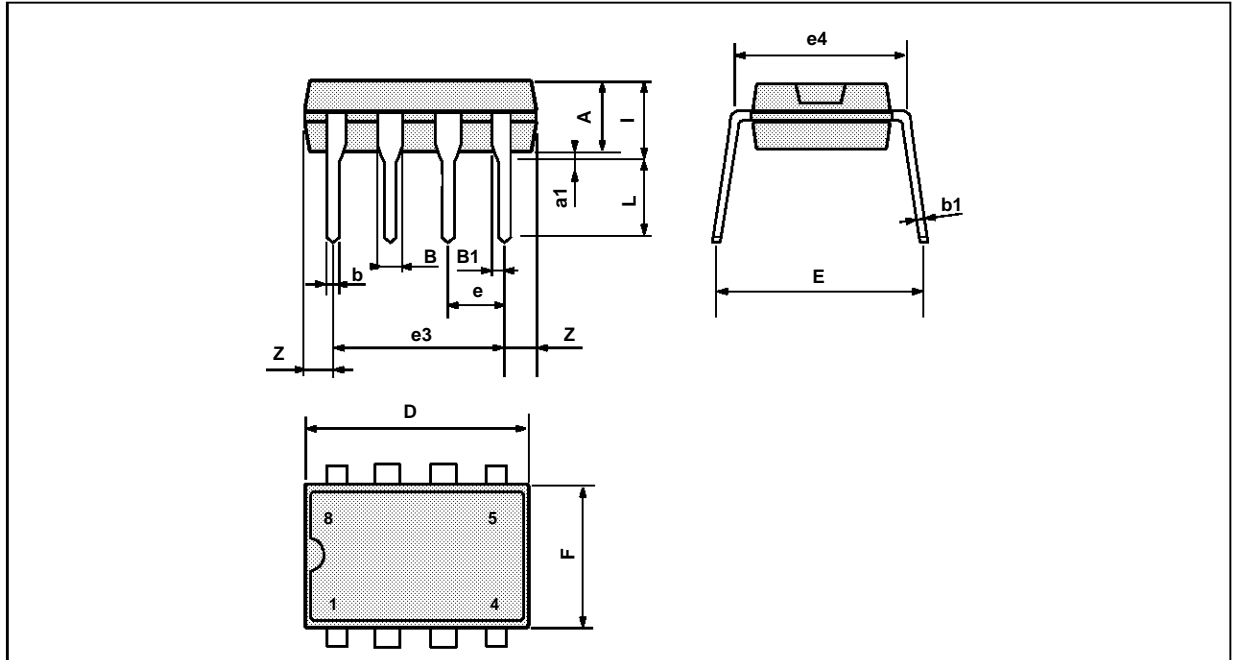
$$\frac{V_o}{V_i} = \frac{1}{1 + 2\xi \frac{S}{\omega_c} + \frac{S^2}{\omega_c^2}}$$

$\omega_c = 2\pi f_c$, with f_c = cut-off frequency
 ξ = damping factor

1033-10.EPS

TEB1033-TEF1033-TEC1033

PACKAGE MECHANICAL DATA
8 PINS - PLASTIC DIP OR CerdIP

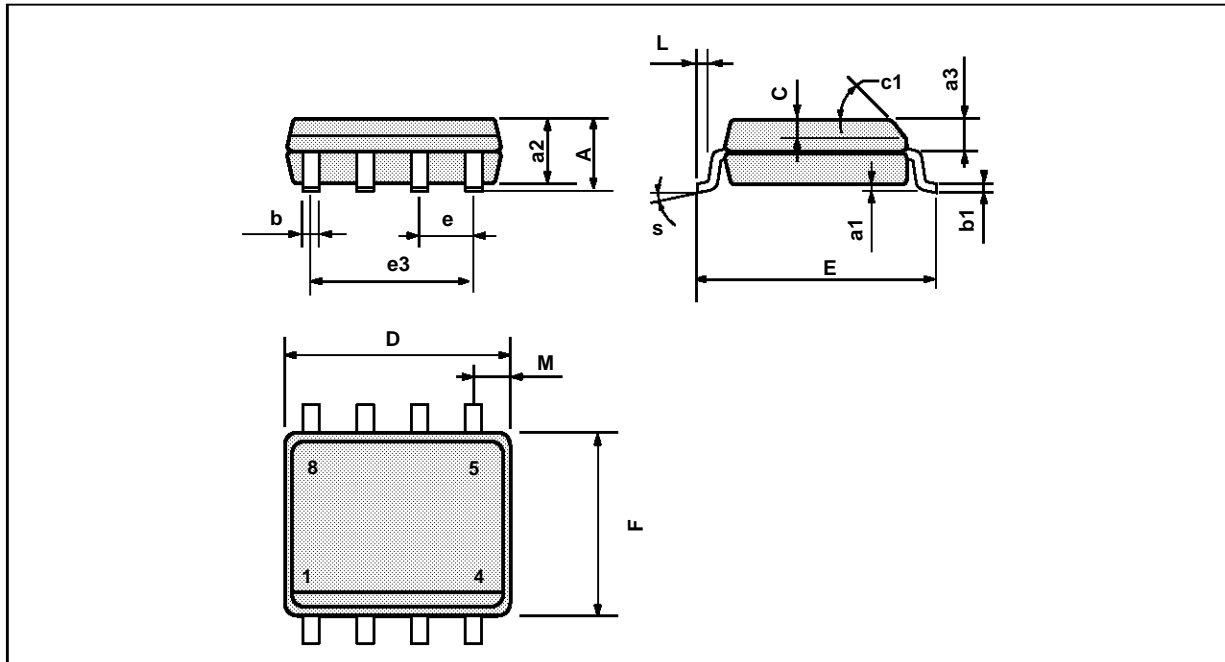


Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

PM-DIP8-EPS

DIP8-TBL

PACKAGE MECHANICAL DATA
8 PINS - PLASTIC MICROPACKAGE (SO)



PM-SO8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

SO8.TEL

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