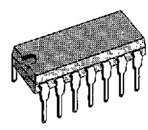
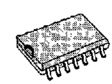
TEB4033 TEF4033-TEC4033

QUAD 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 : 2μV/°C
- LONG TERM STABILITY : 8μV/YEAR (for $T_{amb} \leq 50°C$)
- THE TEB4033 AND TEF4033 ARE PIN TO PIN REPLACEMENT OF THE LS204C AND LS204I RESPECTIVELY



N
DIP14
(Plastic Package)
J
CERDIP14
(Cerdip Package)



D
SO14
(Plastic Micropackage)

DESCRIPTION

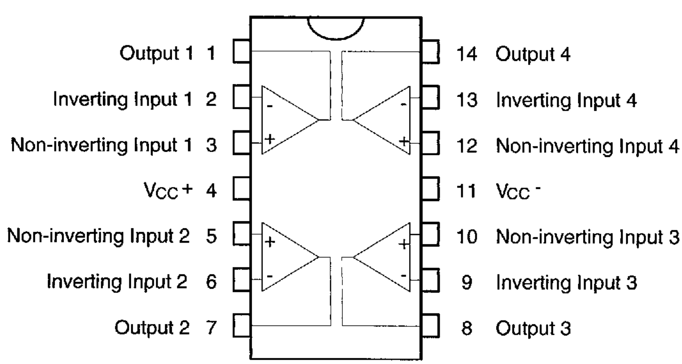
The TEB4033, TEF4033 and TEC4033 are high performance quad-operational amplifiers intended for active filter applications. The internal phase compensation allows stable operation as voltage follower in spite of their high gain-bandwidth products. The circuits present very stable electrical characteristics over the entire supply voltage range.

ORDER CODES

Part Number	Temperature Range	Package		
		N	J	D
TEB4033	0°C, +70°C	•	•	•
TEF4033	–40°C, +105°C	•	•	•
TEC4033	–55°C, +125°C	•	•	•
Example : TEB4033N				

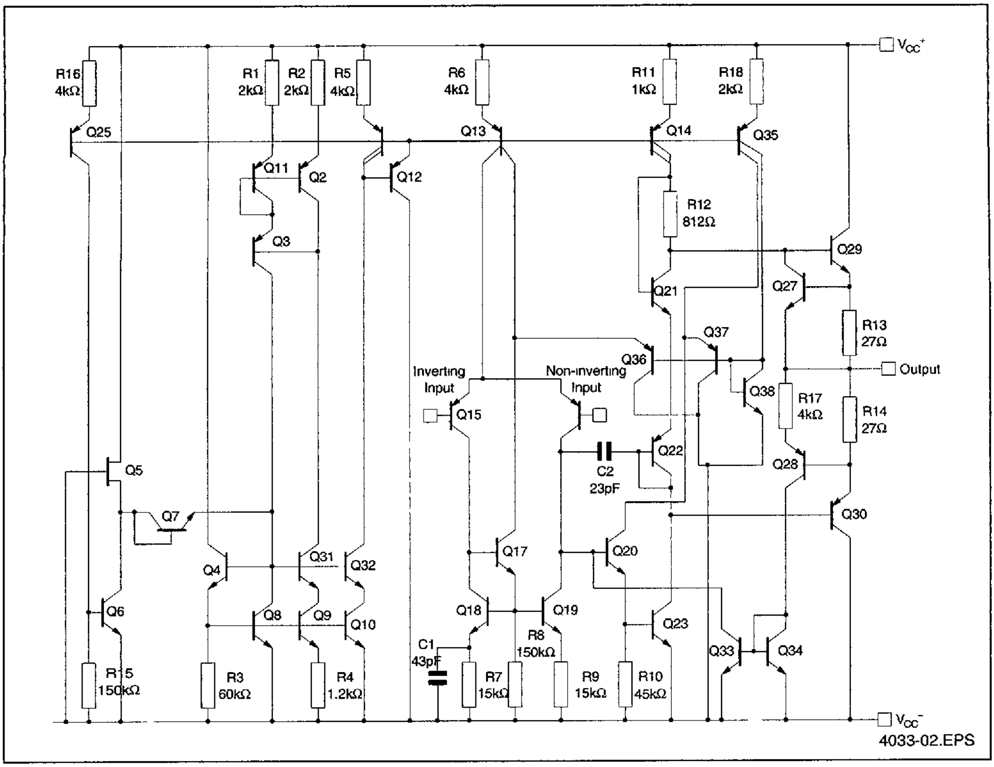
4033-01 TBL

PIN CONNECTIONS (top view)



4033-01.EPS

BLOCK DIAGRAM (1/4 TEB4033)



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	TEB4033 TEF4033 TEC4033	0 to +70 –40 to +105 –55 to +125	°C
T_{stg}	Storage Temperature Range		–65 to +150	°C

4033-02 TBL

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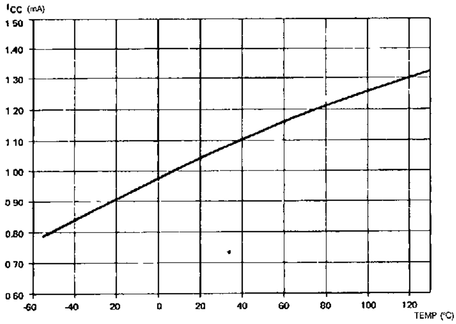
ELECTRICAL CHARACTERISTICS

V_{CC} = ±15V, T_{amb} = +25°C (unless otherwise specified)

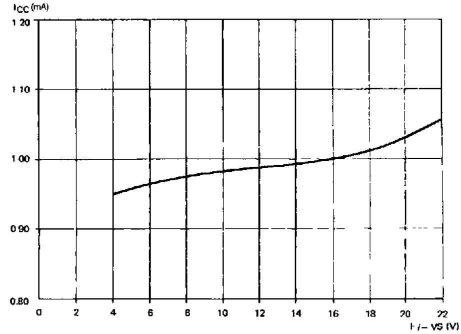
Symbol	Parameter	TEB 1033 TEF 1033 TEC 1033 Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage (R_S ≤ 10kΩ) T_{amb} = 25°C $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$		 0.3	 1 3	mV
DV_{io}	Input Offset Voltage Drift		2		µV/°C
I_{io}	Input Offset Current T_{amb} = 25°C $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$		 5	 20 40	nA
I_{ib}	Input Bias Current T_{amb} = 25°C $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$		 50	 100 200	nA
A_{vd}	Large Signal Voltage Gain (R_L = 2kΩ, V_O = ±10V) T_{amb} = 25°C $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$	 80 40	 120		V/mV
SVR	Supply Voltage Rejection Ratio (DV_{CC} from ±15V to ±4V) T_{amb} = 25°C $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$	 80 70	 100		dB
I_{CC}	Supply Current, all Amp, no Load T_{amb} = 25°C $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$		 2	 3 4	mA
V_{icm}	Input Common Mode Voltage Range T_{amb} = 25°C	 ±12			V
CMR	Common Mode Rejection Ratio (R_S ≤ 10kΩ, V_I = ±10V) T_{amb} = 25°C $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$	 80 70	 100		dB
I_{os}	Output Short-circuit Current T_{amb} = 25°C $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$	 10 10	 23	 40 40	mA
± V_{opp}	Output Voltage Swing T_{amb} = 25°C R_L = 2kΩ $T_{min.}$ ≤ T_{amb} ≤ $T_{max.}$ R_L = 2kΩ V_{CC} = ±4V, R_L = 2kΩ, T_{amb} = 25°C V_{CC} = ±6V, R_L = 600Ω, T_{amb} = 25°C	 13 12 2.8 4.6	 14 3		V
SR	Slew-rate (V_I = ±10V, R_L = 2 kΩ, C_L = 100pF, T_{amb} = 25°C, unity gain)	0.6	1		V/µs
GBP	Gain Bandwidth Product (f = 100kHz, T_{amb} = 25°C, V_{in} = 10mV, R_L = 2kΩ, C_L = 100pF)	1.5	2		MHz
R_I	Input Resistance		1		MΩ
THD	Total Harmonic Distortion (f = 1kHz, A_v = 20dB, R_L = 2kΩ C_L = 100pF, T_{amb} = 25°C, V_o = $2V_{pp}$)		0.008	0.05	%
e_n	Equivalent Input Noise Voltage (f = 1kHz) R_S = 50Ω R_S = 1kΩ R_S = 10kΩ		 8 10 18	 15	$\frac{nV}{\sqrt{Hz}}$
V_{OPP}	Large Signal Voltage Swing R_L =10kΩ, f = 10kHz	26	28		V
Øm	Phase Margin		45		Degrees
V_{o1}/V_{o2}	Channel Separation	100	120		dB

4033-03 TBL



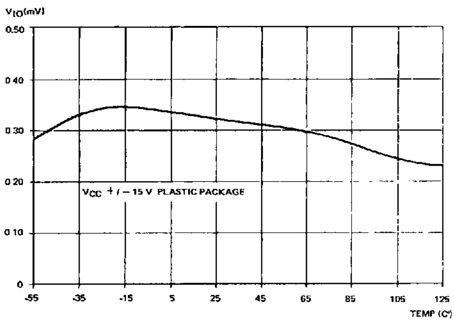
SUPPLY CURRENT VS AMBIENT TEMPERATURE

4033-03 EPS



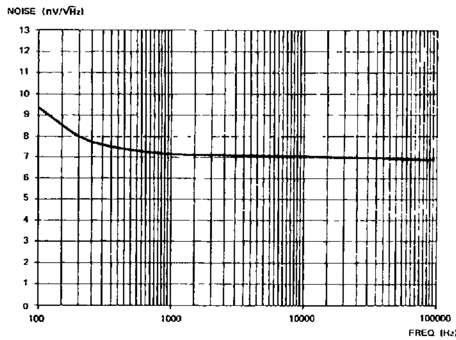
SUPPLY CURRENT VS SUPPLY VOLTAGE

4033-04 EPS



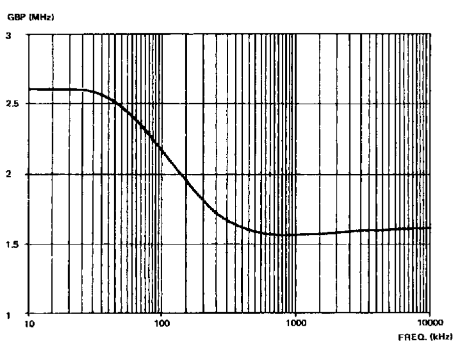
OFFSET VOLTAGE VS. AMBIENT TEMPERATURE

4033-05 EPS



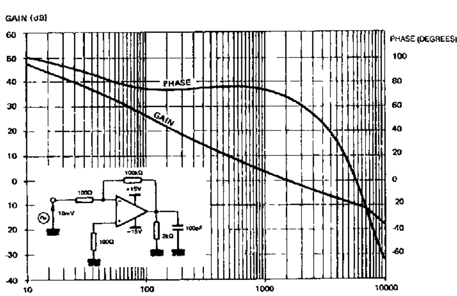
TOTAL INPUT NOISE VS FREQUENCY

4033-06.EPS



GAIN BANDWIDTH PRODUCT VS. FREQUENCY

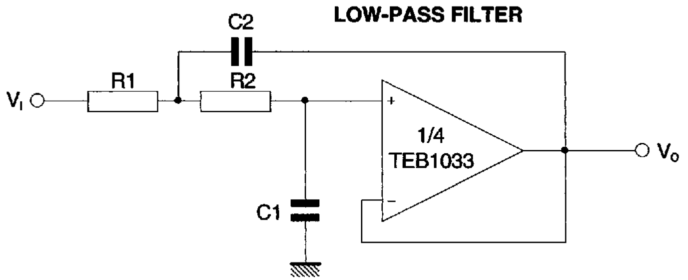
4033-07 EPS



BODE PLOT

4033-08.EPS

TYPICAL APPLICATION



$$\frac{V_O}{V_I} = \frac{1}{1 + 2\xi \frac{S}{\omega_C} + \frac{S^2}{\omega_C^2}}$$

$\varpi_C = 2\pi f_C$, with f_C = cutt-off frequency
ξ = damping factor

4033-09.EPS