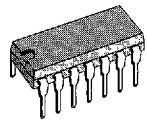
SGS-THOMSON MICROELECTRONICS

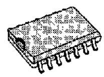
TEB4033 TEF4033-TEC4033

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 $T_{amb} \leq 50^{\circ}C$)
- 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.

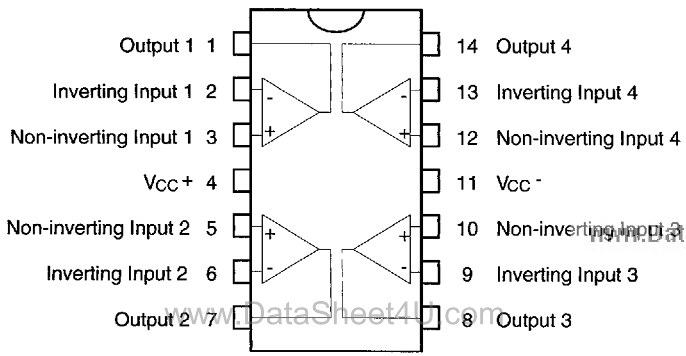
The circuits present very stable electrical characteristics over the entire supply voltage range.

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				

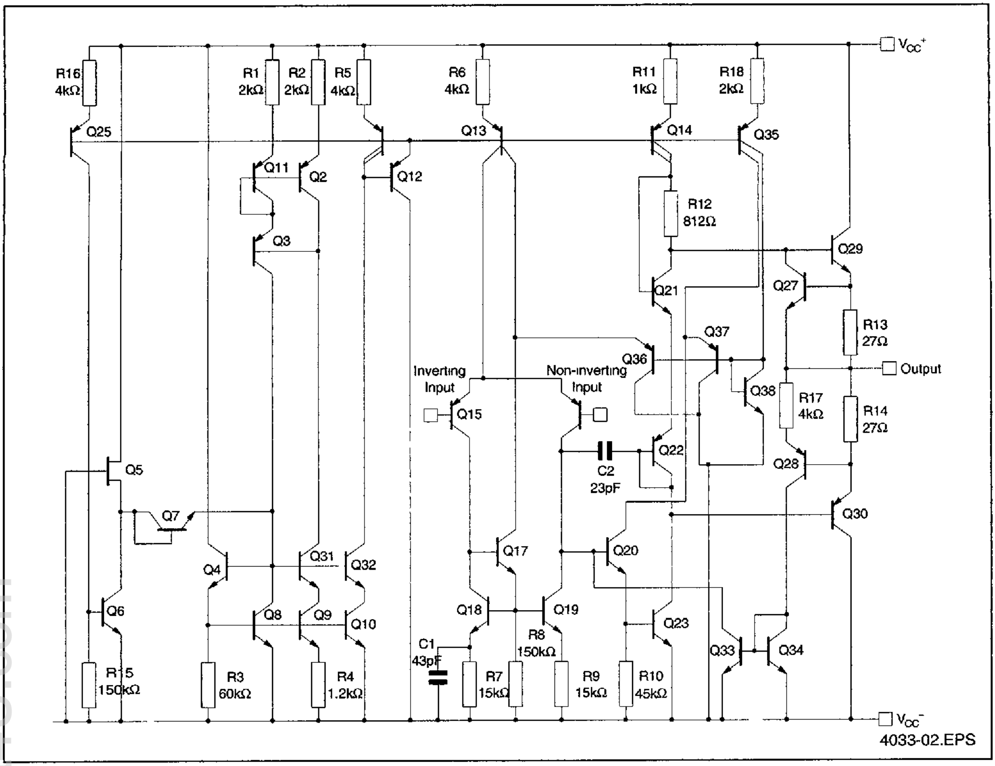
4033-01 TBL

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

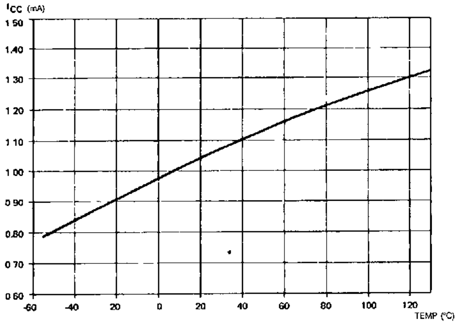
4033-02 TBL

ELECTRICAL CHARACTERISTICS

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

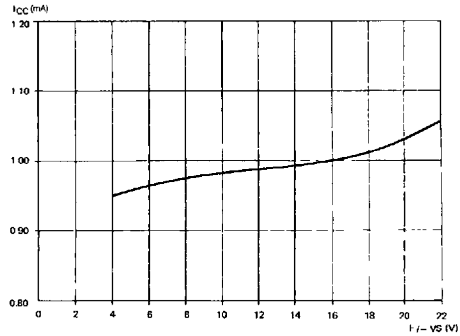
Symbol	Parameter	TEB 1033 TEF 1033 TEC 1033 Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage ($R_S \le 10k\Omega$) $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le T_{max.}$		0.3	1 3	mV
DV_{io}	Input Offset Voltage Drift		2		$\mu V/^oC$
I_{io}	Input Offset Current $T_{amb} = 25^oC$ $T_{min.} \le T_{amb} \le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

4033-03 TBL



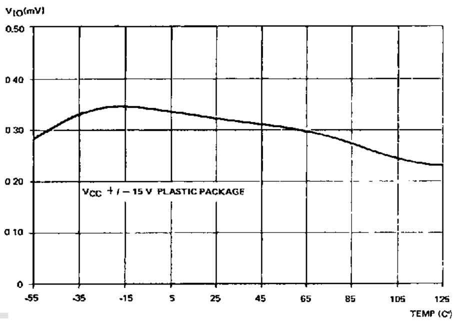
SUPPLY CURRENT VS AMBIENT TEMPERATURE

4033-03 EPS



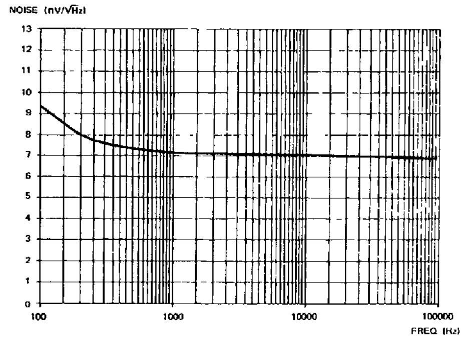
SUPPLY CURRENT VS SUPPLY VOLTAGE

4033-04 EPS



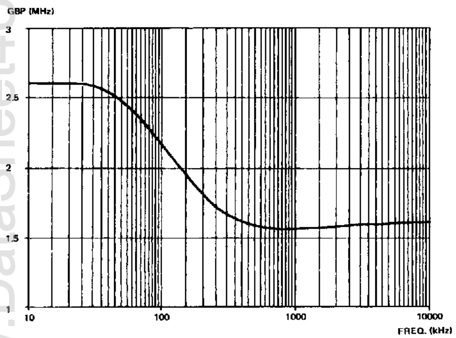
OFFSET VOLTAGE VS. AMBIENT TEMPERATURE

4033-05 EPS



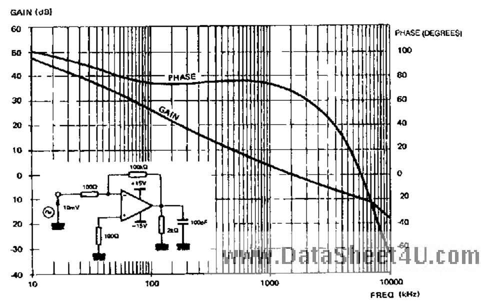
TOTAL INPUT NOISE VS FREQUENCY

4033-06.EPS



GAIN BANDWIDTH PRODUCT VS. FREQUENCY

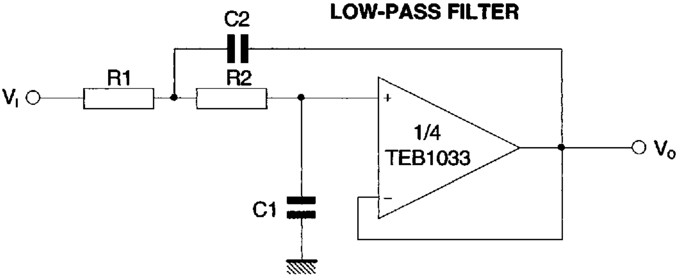
4033-07 EPS



BODE PLOT

4033-08.EPS

TYPICAL APPLICATION



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

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

4033-09.EPS