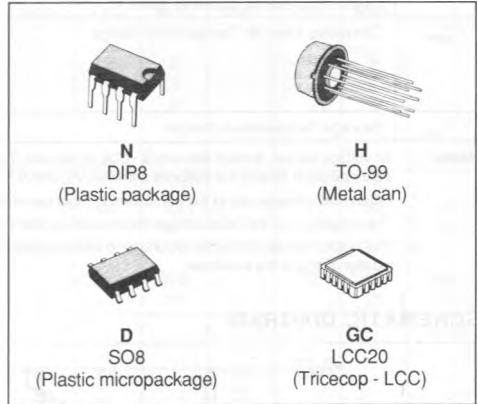


## LOW NOISE J-FET INPUT SINGLE OP-AMPS

- LOW POWER CONSUMPTION
- WIDE COMMON-MODE AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- LOW NOISE  $V_n = 18 \text{ nV}/\sqrt{\text{Hz}}$  (typ)
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J-FET INPUT STAGE
- LOW HARMONIC DISTORTION : 0.01 % (typ)
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : 13 V/ $\mu\text{s}$  (typ)



### DESCRIPTION

The TL071, TL071A and TL071B are high speed J-FET input single operational amplifiers incorporating well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

The devices feature high slew rate, low input bias and, offset current, and low voltage temperature coefficient.

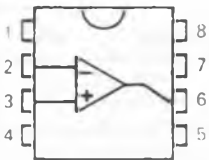
### ORDER CODES

Part Number	Temperature Range	Package			
		N	H	D	GC
TL071M	- 55 °C to + 125 °C		•		•
TL071I	- 40 °C to + 105 °C	•		•	
TL071C	0 °C to + 70 °C	•		•	
TL071AC	0 °C to + 70 °C	•		•	
TL071BC	0 °C to + 70 °C	•		•	

**Note :** Hi-Rel Versions Available  
**Examples :** TL071 MH, TL071 CN

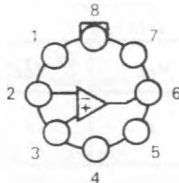
### PIN CONNECTIONS (Top views)

**DIP8  
SO8**



- 1 - Offset null
- 2 - Inverting input
- 3 - Non-inverting input
- 4 - V<sub>CC</sub>

**TO-99**



- 5 - Offset null
- 6 - Output
- 7 - V<sub>CC</sub>
- 8 - NC

**LCC20**



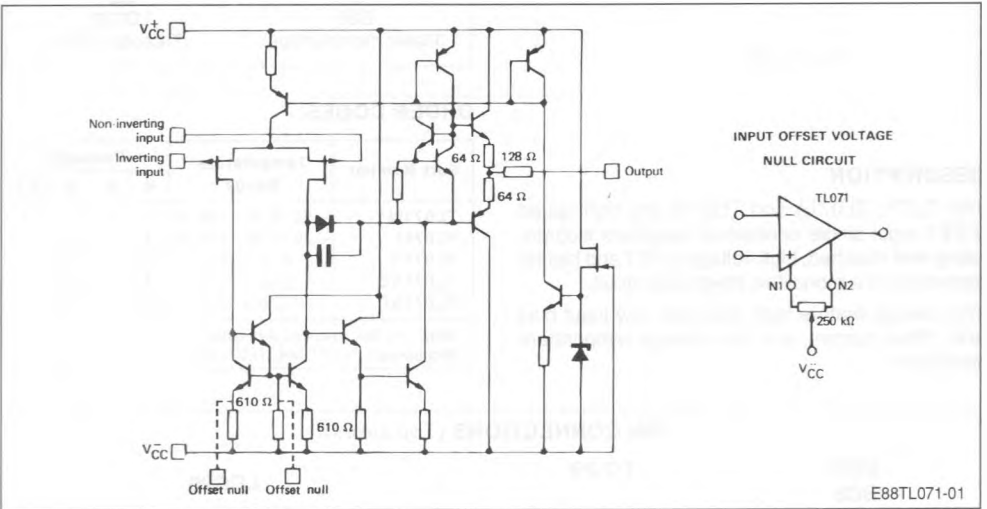
- 1 - NC
- 2 - Offset null
- 3 - NC
- 4 - NC
- 5 - Inverting input
- 6 - NC
- 7 - Non-inverting input
- 8 - NC
- 9 - NC
- 10 - V<sub>CC</sub>
- 11 - NC
- 12 - Offset null
- 13 - NC
- 14 - NC
- 15 - Output
- 16 - NC
- 17 - V<sub>CC</sub>
- 18 - NC
- 19 - NC
- 20 - NC

**MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage (note 1)	$\pm 18$	V
$V_i$	Input Voltage (note 3)	$\pm 15$	V
$V_{ID}$	Diff. Input Voltage (note 2)	$\pm 30$	V
$P_{Tot}$	Power Dissipation	680	mW
	Output Short-circuit Duration (note 4)	Indefinite	
$T_{oper}$	Operating Free-air Temperature Range	TL071C, AC, BC 0 to 70 TL071I, BI - 40 to 105 TL071M - 55 to 125	$^{\circ}C$
$T_{stg}$	Storage Temperature Range	- 65 to 150	$^{\circ}C$

- Notes :**
1. All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between  $V_{CC}$  and  $V_{CC}$ .
  2. Differential voltages are at the non-inverting input terminal with respect to the inverting input terminal.
  3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
  4. The output may be shorted to ground or to either supply. Temperature and /or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

**SCHEMATIC DIAGRAM**



E88TL071-01

Case	Balance	Inverting Input	Non-inverting Input	$V_{CC}$	$V_{CC}^*$	Output	N.C.
DIP8 SO8 TO-99	1, 5	2	3	4	7	6	8
LCC20	2, 12	5	7	10	17	15	*

\* LCC20 : Other pins are not connected.

**ELECTRICAL CHARACTERISTICS**

V<sub>CC</sub> = ± 15 V (unless otherwise specified)

TL071M : - 55 °C ≤ T<sub>amb</sub> ≤ + 125 °C

TL071I, BI : - 40 °C ≤ T<sub>amb</sub> ≤ + 105 °C

TL071C, AC, BC : 0 °C ≤ T<sub>amb</sub> ≤ + 70 °C

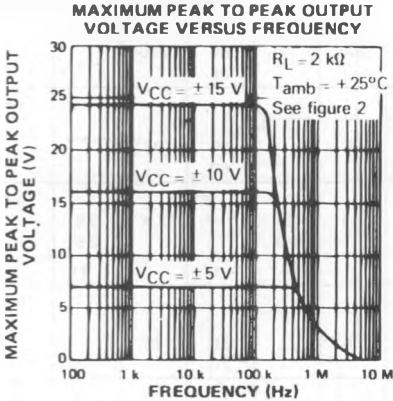
Symbol	Parameter	TL071M, I, BI TL071BC, AC			TL071C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V <sub>IO</sub>	Input Offset Voltage T <sub>amb</sub> = 25 °C (R <sub>S</sub> ≤ 10 kΩ) TL071BI, BC T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub> TL071BI, BC		3 1	5 3 9 5		3	8 13	mV
αV <sub>IO</sub>	Input Offset Voltage Drift		10			10		μV/°C
I <sub>IO</sub>	Input Offset Current * T <sub>amb</sub> = 25 °C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>		5	50 4		5	50 4	pA nA
I <sub>IB</sub>	Input Bias Current * T <sub>amb</sub> = 25 °C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>		20	200 20		20	200 20	pA nA
A <sub>VD</sub>	Large Signal Voltage Gain (R <sub>L</sub> ≥ 2 kΩ, V <sub>O</sub> = ± 10 V) T <sub>amb</sub> = 25 °C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>	50 25	200		50 25	200		V/mV
SVR	Supply Voltage Rejection Ratio (R <sub>S</sub> ≤ 10 kΩ) T <sub>amb</sub> = 25 °C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>	80 80	86		80 80	86		dB
I <sub>CC</sub>	Supply Current, no Load T <sub>amb</sub> = 25 °C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>		1.4	2.5 2.5		1.4	2.5 2.5	mA
V <sub>I</sub>	Input Voltage Range	- 11		+ 11	- 11		+ 11	V
CMR	Common Mode Rejection Ratio (R <sub>S</sub> ≤ 10 kΩ) T <sub>amb</sub> = 25 °C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>	80 80	86		70 70	86		dB
I <sub>OS</sub>	Output Short-circuit Current T <sub>amb</sub> = 25 °C T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub>	10 10	40	60 60	10 10	40	60 60	mA
± V <sub>OPP</sub>	Output Voltage Swing T <sub>amb</sub> = 25 °C R <sub>L</sub> ≥ 2 kΩ R <sub>L</sub> ≥ 10 kΩ T <sub>min</sub> ≤ T <sub>amb</sub> ≤ T <sub>max</sub> R <sub>L</sub> ≥ 2 kΩ R <sub>L</sub> ≥ 10 kΩ	11 12 11 12	12 13.5		11 12 11 12	12 13.5		V
S <sub>VO</sub>	Slew-rate (V <sub>I</sub> = 10 V, R <sub>L</sub> = 2 kΩ C <sub>L</sub> ≤ 100 pF, T <sub>amb</sub> = 25 °C, unity gain)	12	16		8	16		V/μs
t <sub>r</sub>	Rise Time (V <sub>I</sub> = 20 mV, R <sub>L</sub> = 2 kΩ C <sub>L</sub> = 100 pF, T <sub>amb</sub> = 25 °C, unity gain)		0.1			0.1		μs

\* The input bias currents are junction leakage currents which approximately double for every 10 °C increase in the junction temperature.

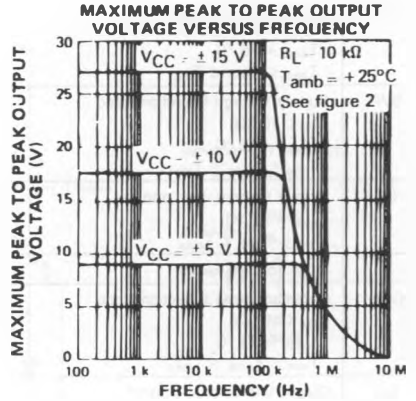
ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	TL071M, 1, BI TL071BC, AC			TL071C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$K_{OV}$	Overshoot ( $V_I = 20$ mV, $R_L = 2$ k $\Omega$ $C_L \leq 100$ pF, $T_{amb} = 25$ °C, unity gain)		10			10		%
GBP	Gain Bandwidth Product ( $f = 100$ kHz, $T_{amb} = 25$ °C $V_{IN} = 10$ mV, $R_L = 2$ k $\Omega$ , $C_L = 100$ pF) TL071BI, BC	2.5 3.3	4.0 4.0	5.0 5.0	2.5	4.0	5.0	MHz
$R_I$	Input Resistance ( $T_{amb} = 25$ °C)		$10^{12}$			$10^{12}$		$\Omega$
THD	Total Harmonic Distortion ( $f = 1$ kHz, $A_V = 20$ dB, $R_L = 2$ k $\Omega$ $C_L \leq 100$ pF, $T_{amb} = 25$ °C, $V_O = 2$ V <sub>PP</sub> )		0.01			0.01		%
$V_n$	Equivalent Input Noise Voltage ( $f = 1$ kHz, $R_g = 100$ $\Omega$ )		15			15		nV/ $\sqrt{Hz}$
$\phi_m$	Phase Margin		45			45		Degrees

TYPICAL CHARACTERISTICS

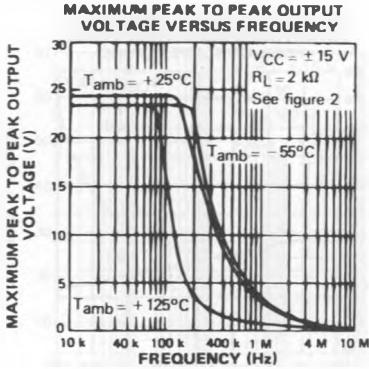


E88TL071-02

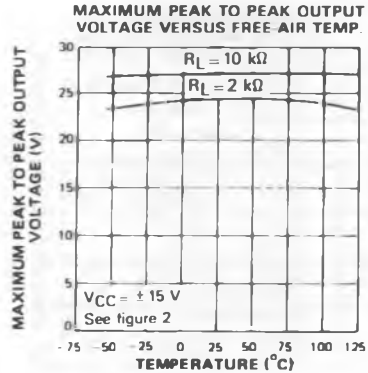


E88TL071-03

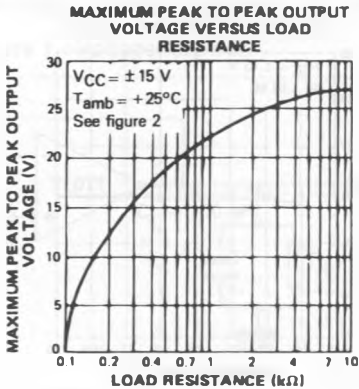
TYPICAL CHARACTERISTICS (continued)



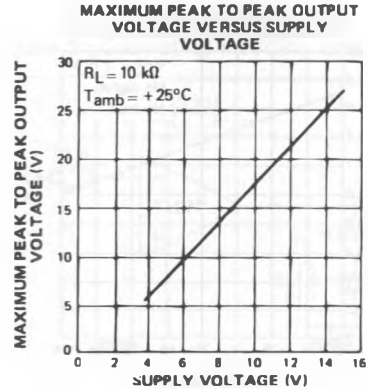
E88TL071-04



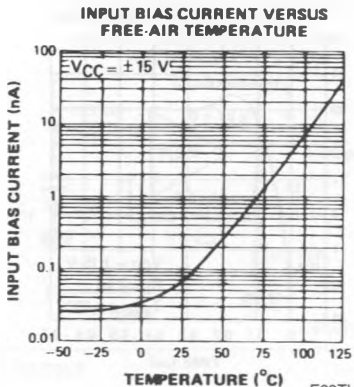
E88TL071-05



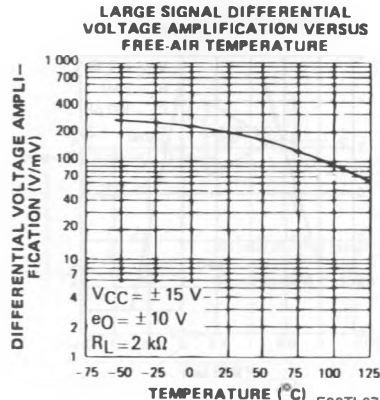
E88TL071-06



E88TL071-07

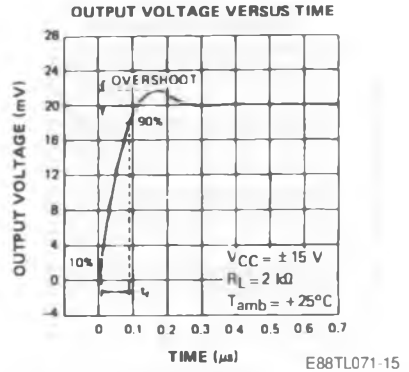
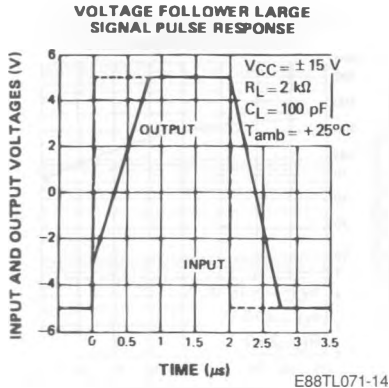
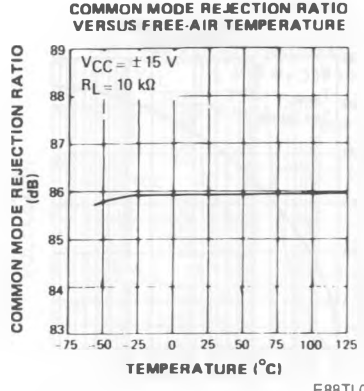
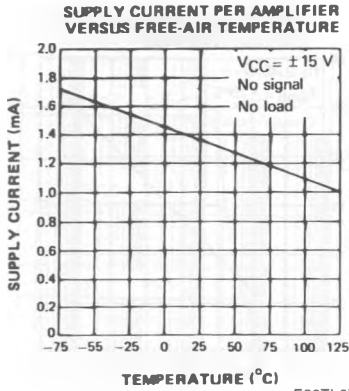
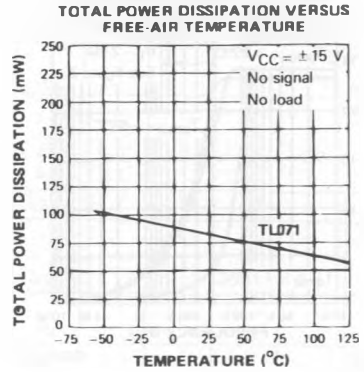
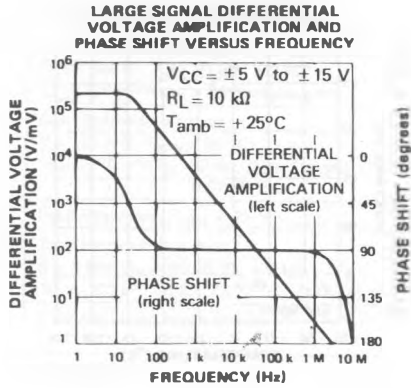


E88TL071-08

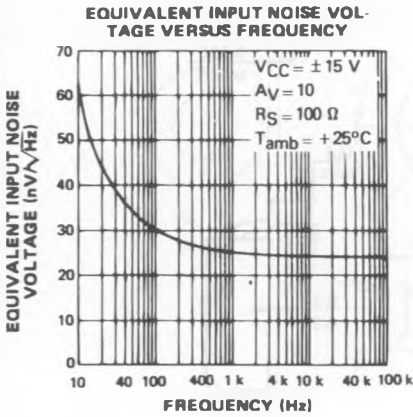


E88TL071-09

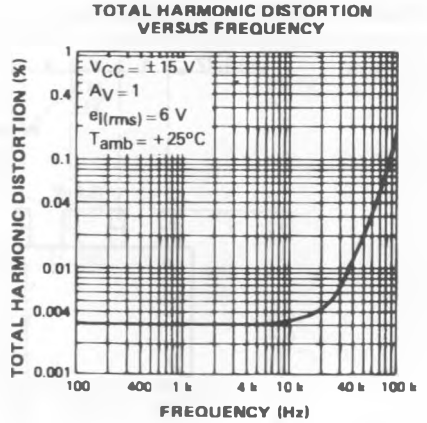
TYPICAL CHARACTERISTICS (continued)



TYPICAL CHARACTERISTICS (continued)



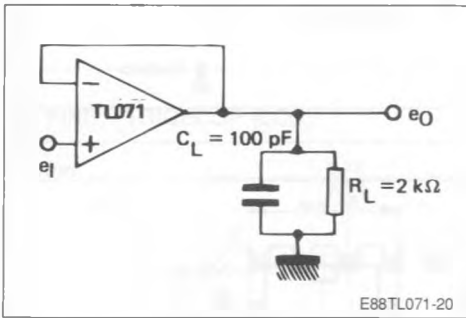
E88TL071-16



E88TL071-17

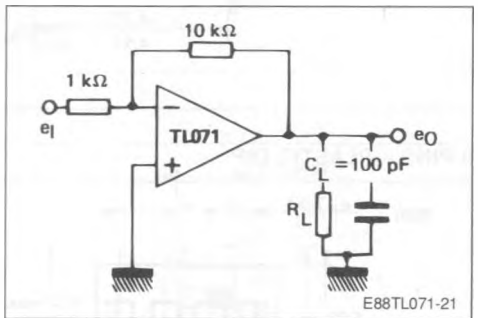
PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage follower.



E88TL071-20

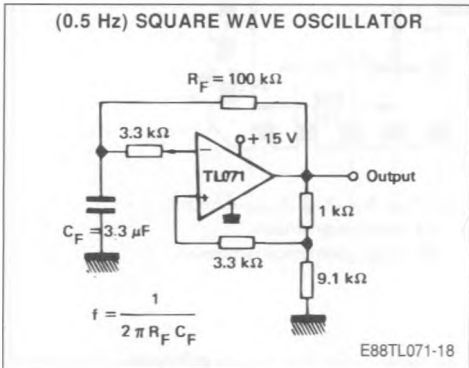
Figure 2 : Gain-of-10 inverting amplifier.



E88TL071-21

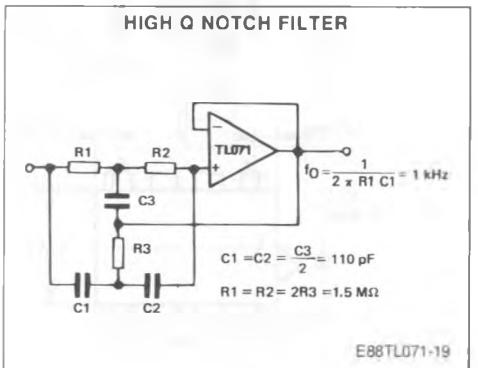
TYPICAL APPLICATIONS

(0.5 Hz) SQUARE WAVE OSCILLATOR



E88TL071-18

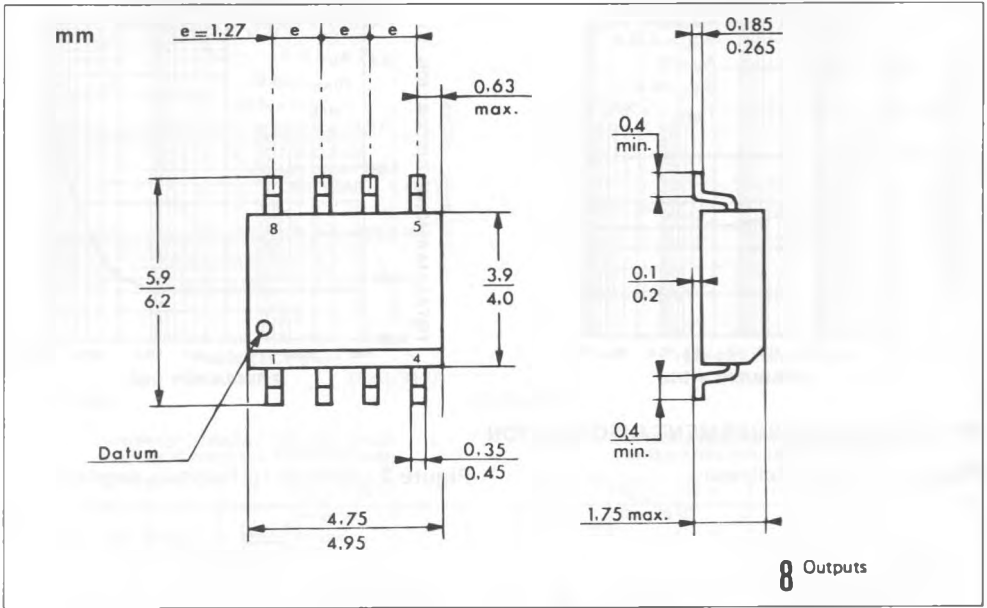
HIGH Q NOTCH FILTER



E88TL071-19

PACKAGE MECHANICAL DATA

8 PINS – PLASTIC MICROPACKAGE (SO)



8 PINS – PLASTIC DIP

