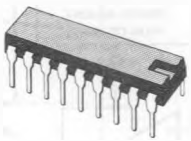
SGS-THOMSON MICROELECTRONICS

TSG8670

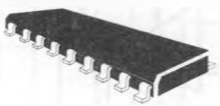
MPF VOICE-GRADE DUAL FILTER FOR TELEPHONE LINE INTERFACE SWITCHED CAPACITOR FILTER

OUT1 : RECEIVE LOW-PASS FILTER
- CAUER TYPE
- 4TH ORDER
- STOPBAND ATTENUATION : 34dB
- PASSBAND RIPPLE : 0.3dB
- CLOCK TO CUTOFF FREQUENCY RATIO : 85.33
- CLOCK FREQUENCY RANGE : 32 TO 1000kHz
- CUTOFF FREQUENCY RANGE : 188Hz TO 12kHz

OUT2 : TRANSMIT BAND-PASS FILTER
- 8TH ORDER (5th order CAUER low-pass + 3rd order CHEBYCHEV high-pass)
- SELECTIVITY FACTOR : Q = 0.52
- UPPER STOPBAND ATTENUATION : 42dB
- PASSBAND RIPPLE : 0.2dB
- CLOCK TO CENTER FREQUENCY RATIO : 148
- CLOCK FREQUENCY RANGE : 32 TO 1000kHz
- CENTER FREQUENCY RANGE : 216Hz TO 6.7kHz



P
DIP-18
(Plastic Package)

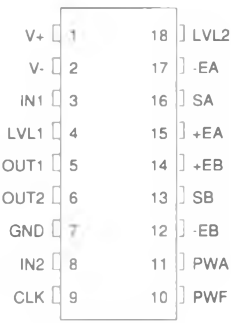


FP
SO-18
(Plastic Micropackage)

DESCRIPTION

The TSG8670 is a HCMOS voice-grade dual filter for telephone line interface.

PIN CONNECTIONS



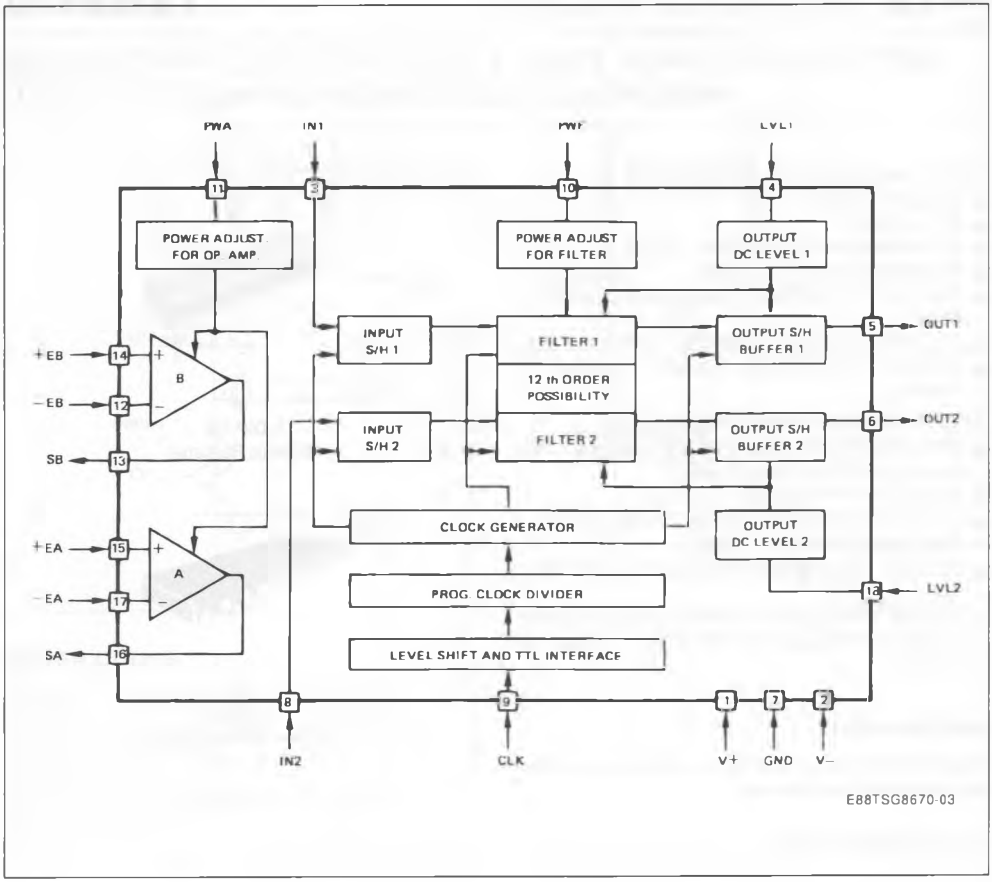
DIP-18 Package

E88TSG8670-01

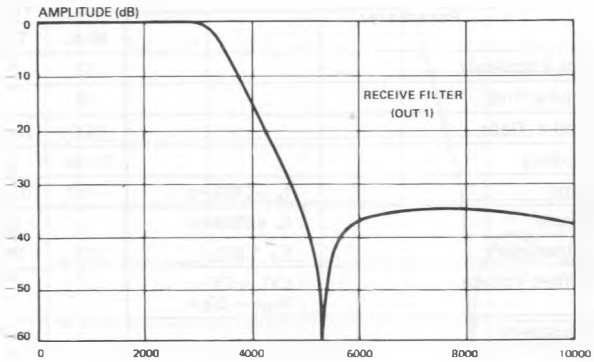
SO-18 Package

E88TSG8670-02

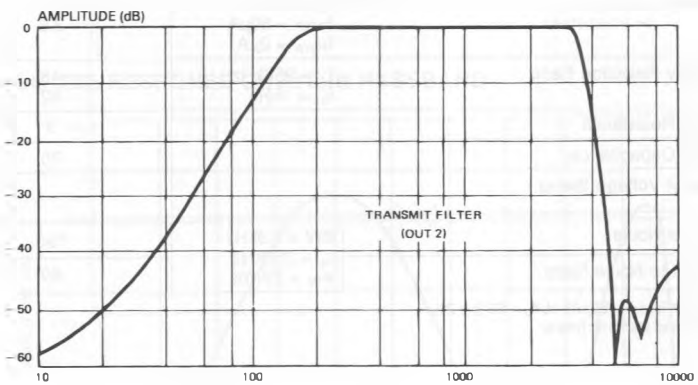
BLOCK DIAGRAM



TYPICAL AMPLITUDE RESPONSE CURVE FOR TELEPHONE APPLICATION (CLK = 256kHz)



E88TSG8670-04



E88TSG8670-05

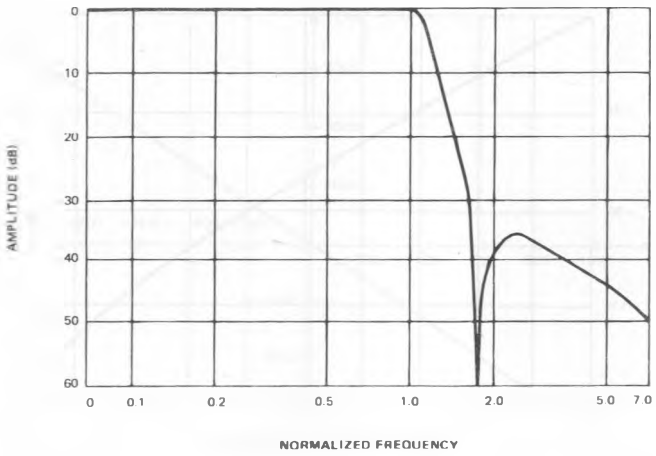
ELECTRICAL OPERATING CHARACTERISTICS

T_{amb} = 25°C, V + = 5V, V − = − 5V, R_L = 5kΩ, CL = 100pF, I_{PWF} = 50µA (unless otherwise specified)

Symbol	Parameter		Value			Unit
			Min.	Typ.	Max.	
f_e	External Clock Frequency		32		1000(*)	kHz
f_i	Internal Sampling Freq.		16		500(*)	kHz
f_e f_c	Clock to Cutoff fr. Ratio		83.6	85.33	87.05	
f_c	Cut Off Frequency		0.188		12(*)	kHz
G_0	Passband Gain	f_e = 256kHz	− 0.2	0.065	+ 0.3	dB
A_P	Passband Ripple	f_e = 256kHz		0.3	0.5	dB
A_S	Stop Band Attenuation	$f > 1.63f_c$	33	34.8		dB
V_{off}	Output DC Offset Voltage	LVL = 0V I_{PWF} = 50µA		± 80	± 150	mV
LVL	DC Level Adjustment			± 45.5		mV
LG	Level gain			− 3.3		
R_{PWF}	PWF Resistance		20		200	kΩ
I_{PWF}	Input Current on PWF		50		150	µA
I+ I−	Supply Current (**)	f_e = 256kHz I_{PWF} = 50µA I_{PWA} = 0µA		3.6 3.6	5 5	mA
PSRR+ PSRR−	Supply Rejection Ratio	f_e = 256kHz f_{in} = 1kHz		46 42		dB
R_{IN}	Input Resistance			3		MΩ
C_{IN}	Input Capacitance			20		pF
V_O	Output Voltage Swing				+ 3.5 − 4.5	VPP
V_A	Output Noise	BW = 5.9kHz f_e = 256kHz V_{IN} = 2Vrms		190		µVrms
SNR	Signal to Noise Ratio			80		dB

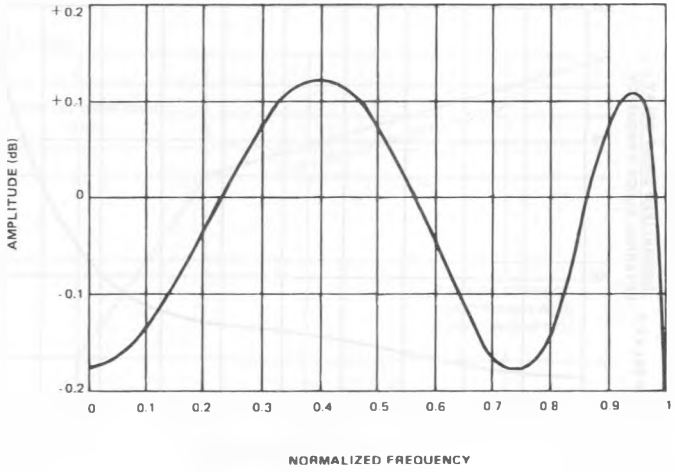
(*) At maximum f_e (with I_{PWF} = 150µA) : f_e/f_o = 85.3 ± 2%.
(**) For both receive and transmit filters.

TYPICAL AMPLITUDE RESPONSE CURVE



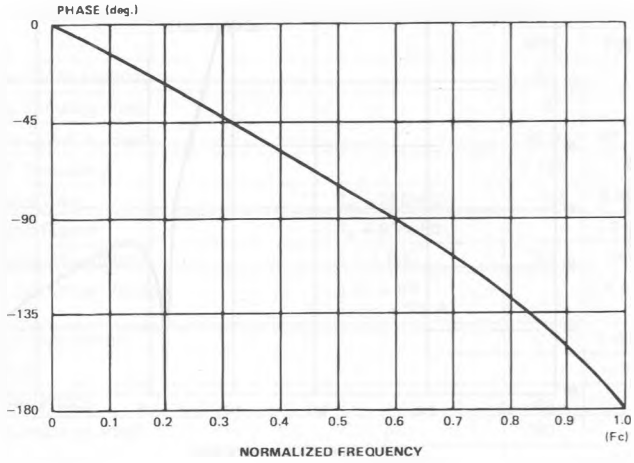
E88TSG8670-06

TYPICAL AMPLITUDE RESPONSE CURVE IN PASSBAND



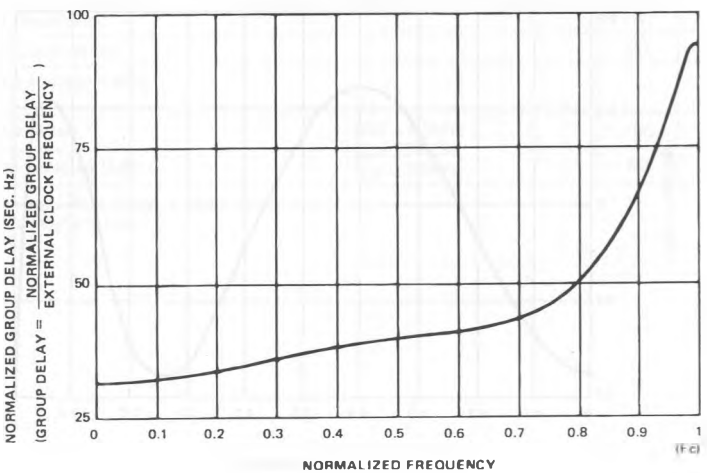
E88TSG8670-07

TYPICAL PHASE RESPONSE CURVE IN PASSBAND



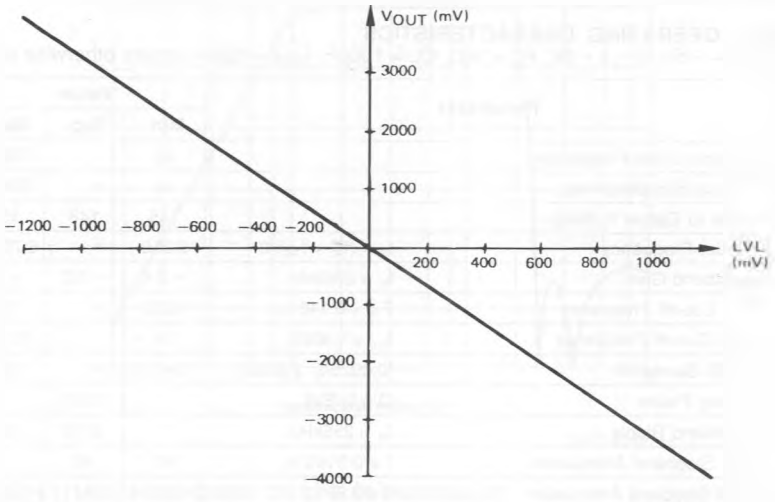
E88TSG8670-08

TYPICAL GROUP DELAY CURVE IN PASSBAND



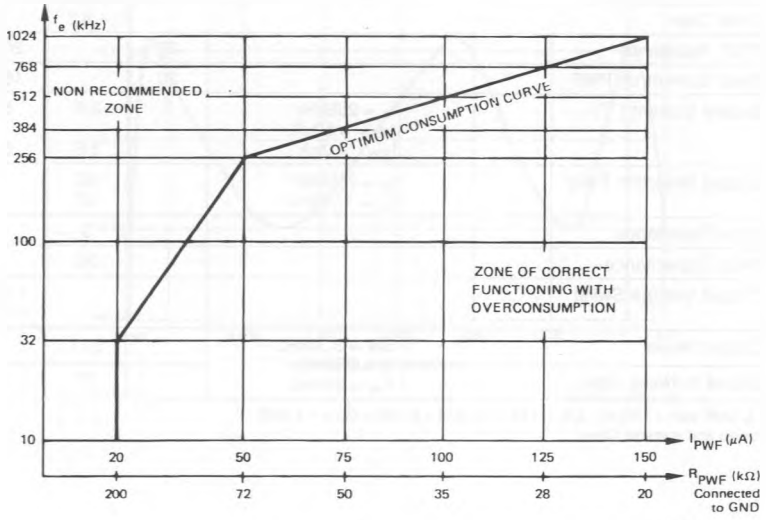
E88TSG8670-09

TYPICAL OUTPUT DC VOLTAGE ADJUSTMENT FROM LVL PIN



E88TSG8670-10

USER'S GUIDE FOR I_{PWF} AND R_{PWF} CHOICE



E88TSG8670-11

2nd FILTER SPECIFICATIONS

Transmit bandpass filter Order : 8

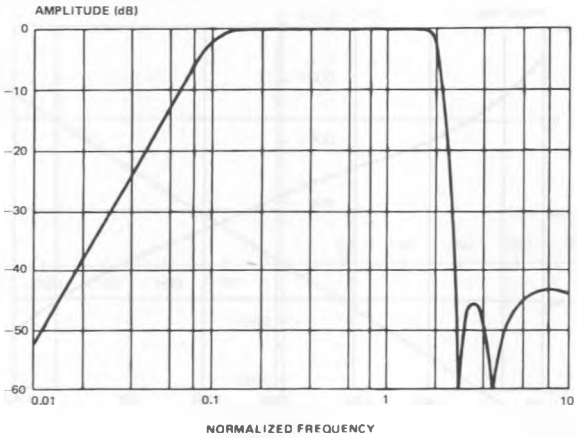
ELECTRICAL OPERATING CHARACTERISTICS

T_{amb} = 25°C, V + = 5V, V − = − 5V, R_L = 5kΩ, CL = 100pF, I_{PWF} = 50µA (unless otherwise specified)

Symbol	Parameter		Value			Unit
			Min.	Typ.	Max.	
f_e	External Clock Frequency		32		1000(*)	kHz
f_i	Internal Sampling Freq.		16		500(*)	kHz
f_e/f_c	Clock to Center fr. Ratio		145	148	151	
f_0	Center Frequency	$f_0 = (f_{lc} + f_{hc})/2$	0.216		6.757(*)	kHz
G_0	Passband Gain	f_e = 256kHz	− 0.4	− 0.2	+ 0	dB
f_{lc}	Low Cut-off Frequency	$F_{lc} = 0.148\ f_0$	0.032		1(*)	kHz
f_{hc}	High Cut-off Frequency	$f_{hc} = 1.852 f_0$	0.4		12.5(*)	kHz
BW	− 3dB Bandwidth	$[0.0925 f_0, 2.023 f_0]$	0.417		13(*)	kHz
Q	Quality Factor	$Q = f_0/BW$		0.52		
A_P	Passband Ripple	f_e = 256kHz		0.15	0.3	dB
Als	Low Stopband Attenuation	$f < 0.0145\ f_0$	41	42		dB
Ahs	High Stopband Attenuation	$f > 2.83\ f_0$	41	42		dB
V_{off}	Output DC Offset Voltage	LVL = 0V I_{PWF} = 50µA		± 50	± 300	mV
LVL	DC Level Adjustment			± 48		mV
LG	Level Gain			− 6.2		
R_{PWF}	PWF Resistance		20		200	kΩ
I_{PWF}	Input Current on PWF		20		150	µA
I + I −	Supply Current (**)	f_e = 256kHz I_{PWF} = 50µA I_{PWA} = 0µA		3.6 3.6	5 5	mA
PSRR + PSRR −	Supply Rejection Ratio	f_e = 256kHz f_{in} = 1.73kHz		32 42		dB
R_{IN}	Input Resistance			3		MΩ
C_{IN}	Input Capacitance			20		pF
V_O	Output Voltage Swing				+ 3.5 − 4.5	VPP
V_A	Output Noise	BW = 3.34kHz f_e = 256kHz V_{IN} = 2Vrms		277		µVrms
SNR	Signal to Noise Ratio			77		dB

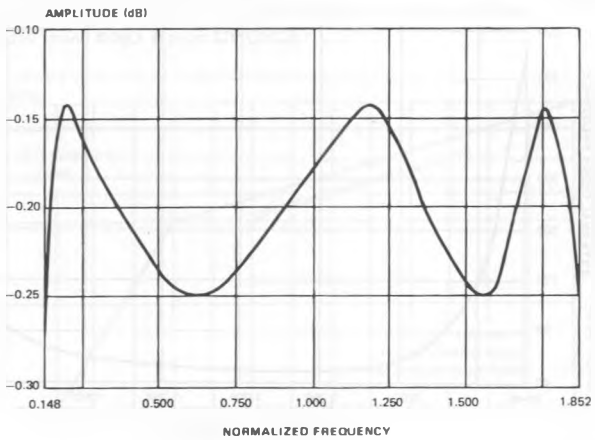
(*) At maximum f_e (with I_{PWF} = 150µA) : f_e/f_o = 148 ± 2% and − 0.7dB < G_O < − 0.3dB.
(**) For both receive and transmit filters.

TYPICAL AMPLITUDE RESPONSE CURVE



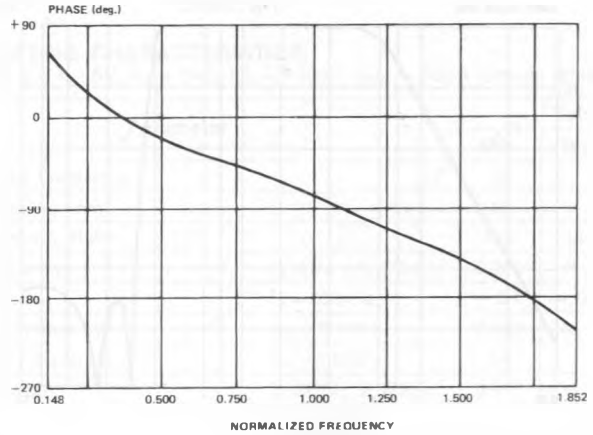
E88TSG8670-12

TYPICAL AMPLITUDE RESPONSE CURVE IN PASSBAND



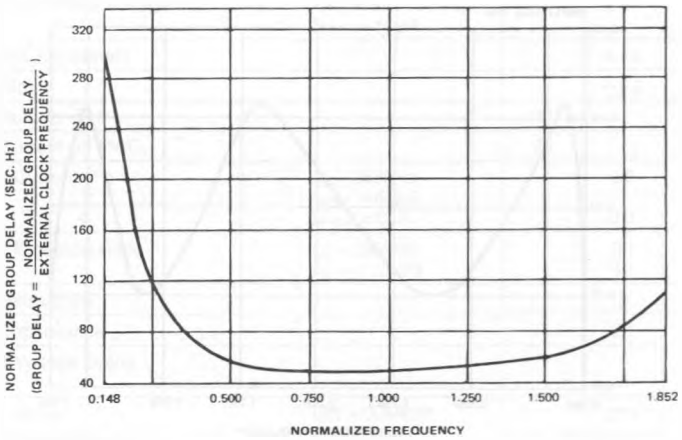
E88TSG8670-13

TYPICAL PHASE RESPONSE CURVE IN PASSBAND



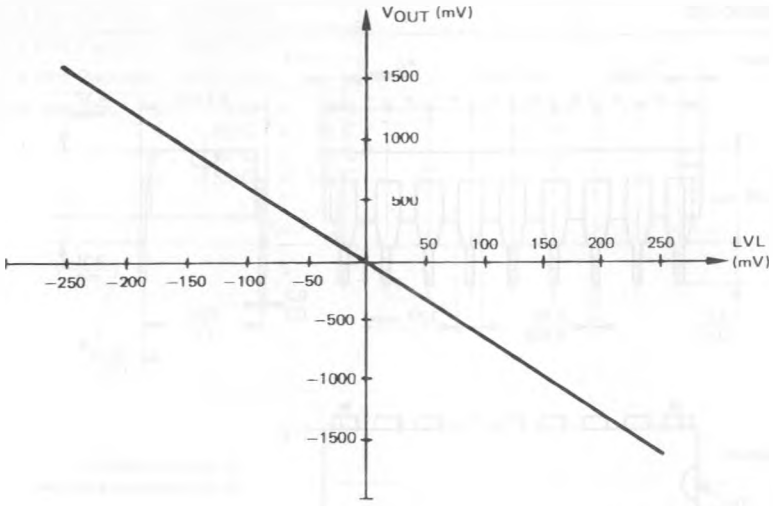
E88TSG8670-14

TYPICAL GROUP DELAY CURVE IN PASSBAND



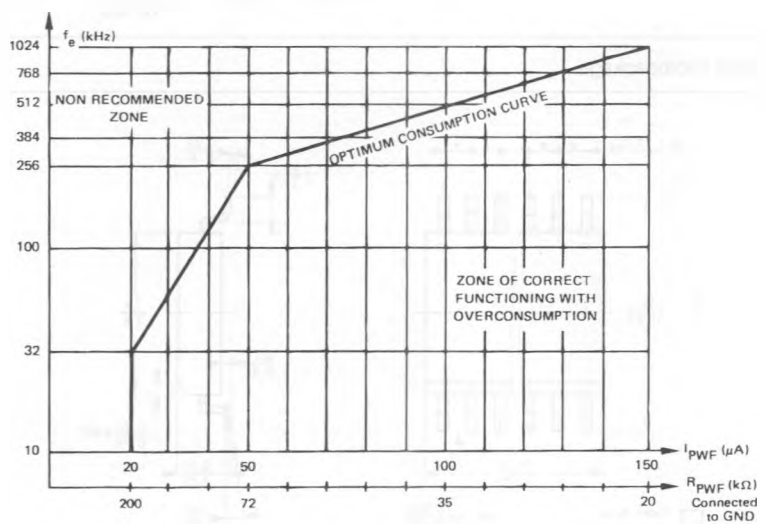
E88TSG8670-15

TYPICAL OUTPUT DC VOLTAGE ADJUSTMENT FROM LVL PIN



E88TSG8670-16

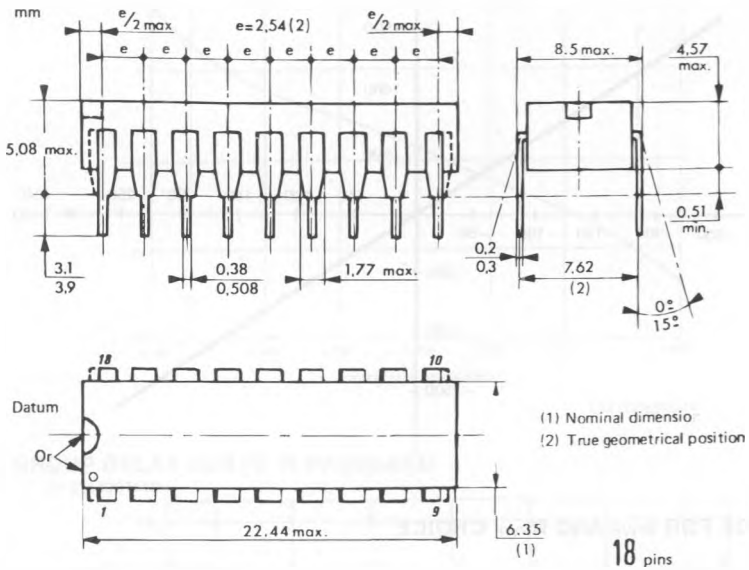
USER'S GUIDE FOR IPWF AND RPWF CHOICE



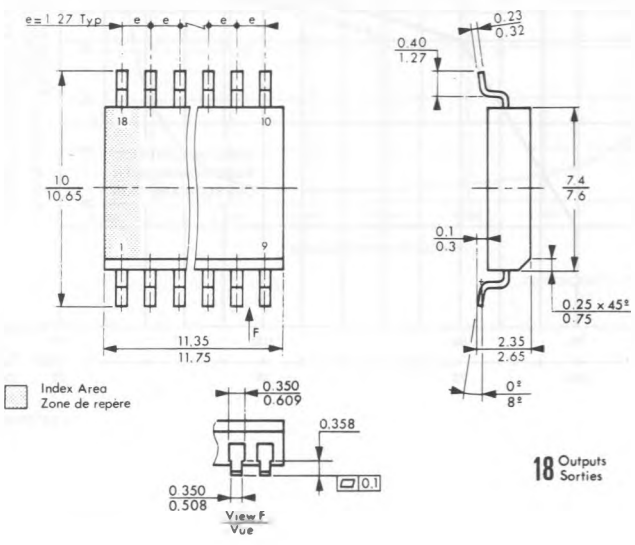
E88TSG8670-17

PACKAGE MECHANICAL DATA

18 PINS - Plastic Dip



18 PINS - Plastic Micropackage



ORDER CODES

Plastic	18 Pins Package : TSG8670XP
Ceramic	18 Pins Package : TSG8670XC
Cerdip	18 Pins Package : TSG8670XJ

X : Temperature Range = C : 0°C + 70°C
I : – 25°C + 85°C
V : – 40°C + 85°C
M : – 55°C + 125°C