



*Caroline Downing 94-461*

REV OR	REV	REF	DESCRIPTION OF CHANGE	CHK BY	DATE
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<p style="text-align: center;"><i>Caroline Downing</i> Writer</p> <p style="text-align: center;"><i>Caroline Downing</i> Originator</p>					
<p style="text-align: center;">155-0195-00</p>					
<p style="text-align: center;">PART NUMBER</p>					

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 <b>TEKTRONIX, INC.</b>		P. O. BOX 500 BEAVERTON, OREGON U.S.A. 97077			
DWN/ WR		DIMENSIONS ARE IN INCHES / MM			
COMP ENGR		TOLERANCES: UNLESS OTHERWISE SPECIFIED			
CHKR/ COORD		DEC	ANLR		
INSTR DSGN		SCALE	FIRST USED ON		
MATERIAL					
FINISH					
TITLE					
DIODE SHAPER CIRCUIT: H789					

SH 1 OF 11	CODE IDENT NO <b>80009</b>	SIZE <b>A</b>	PART NUMBER 155-0195-00	REV OR
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## 1.0

DESCRIPTION

This hybrid is a diode shaper circuit designed to convert a triangle waveform input to a sine wave output with limited harmonic distortion. The circuit consists of a thin film resistor - conductor network on a 13 x 23 x .6 mm substrate with 10 Schottky diodes mounted and wire bonded to it and the entire assembly housed in a 24 pin hermetic package.

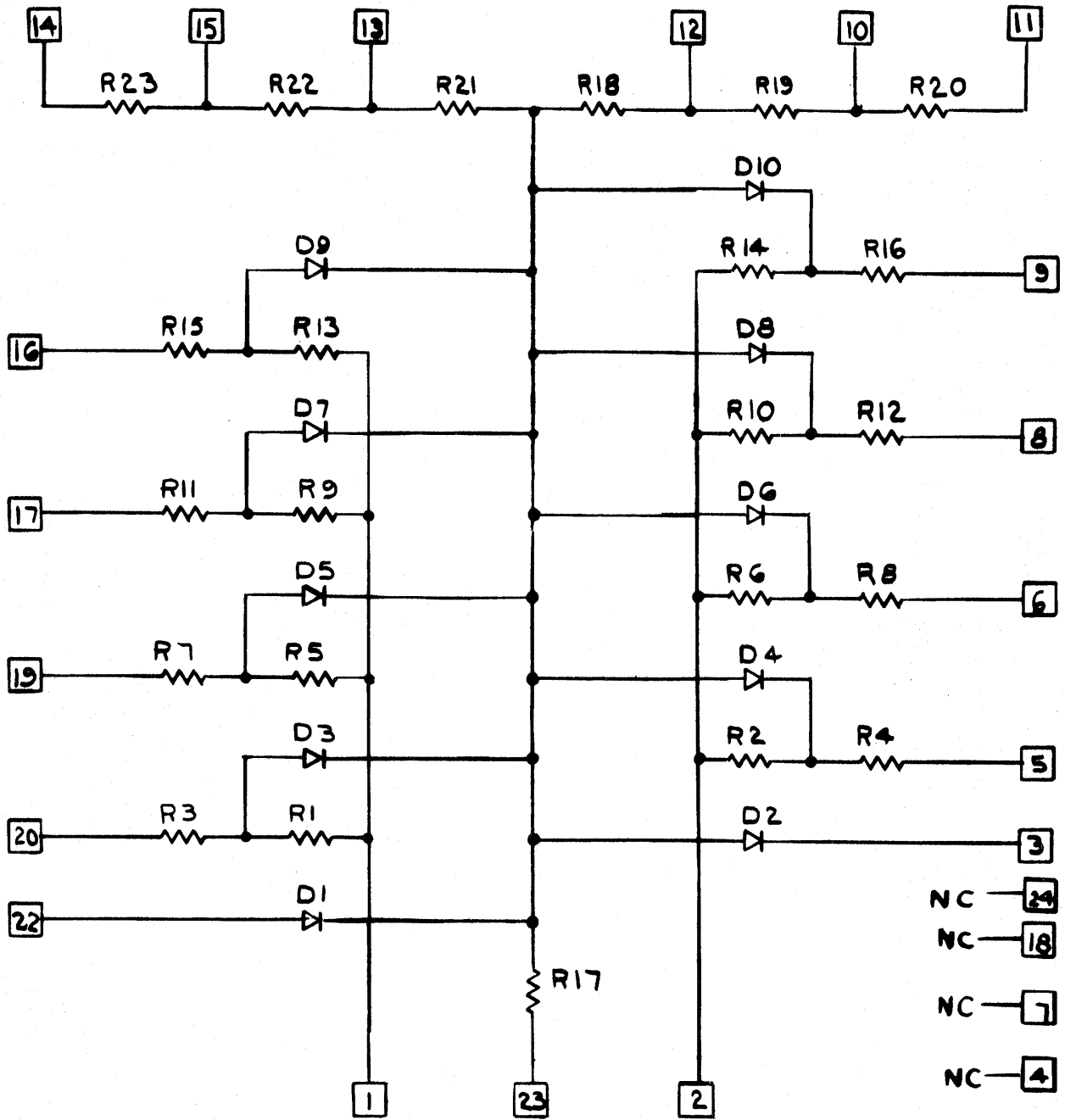
The pins are in 2 rows of 12 pins each on .10" centers with spacing between rows of .60". The circuit is intended for operation up to 20 MHz.

## 2.0

ABSOLUTE MAXIMUM RATINGS

SYMBOLS	IDENTIFICATION	PIN NUMBER	VALUE	UNITS
$V_{IN}$	Input Voltage	Pin 23	$\pm 7$	V
$V_{CC}$	+Supply Voltage	Pins 3, 5, 6, 8, and 9	3.5	V
$V_{EE}$	-Supply Voltage	Pins 16, 17, 19, 20, and 22	3.5	V
$T_S$	Storage Temperature		- 40 + 75	Deg C
$T_0$	Operating Temperature		0 + 75	

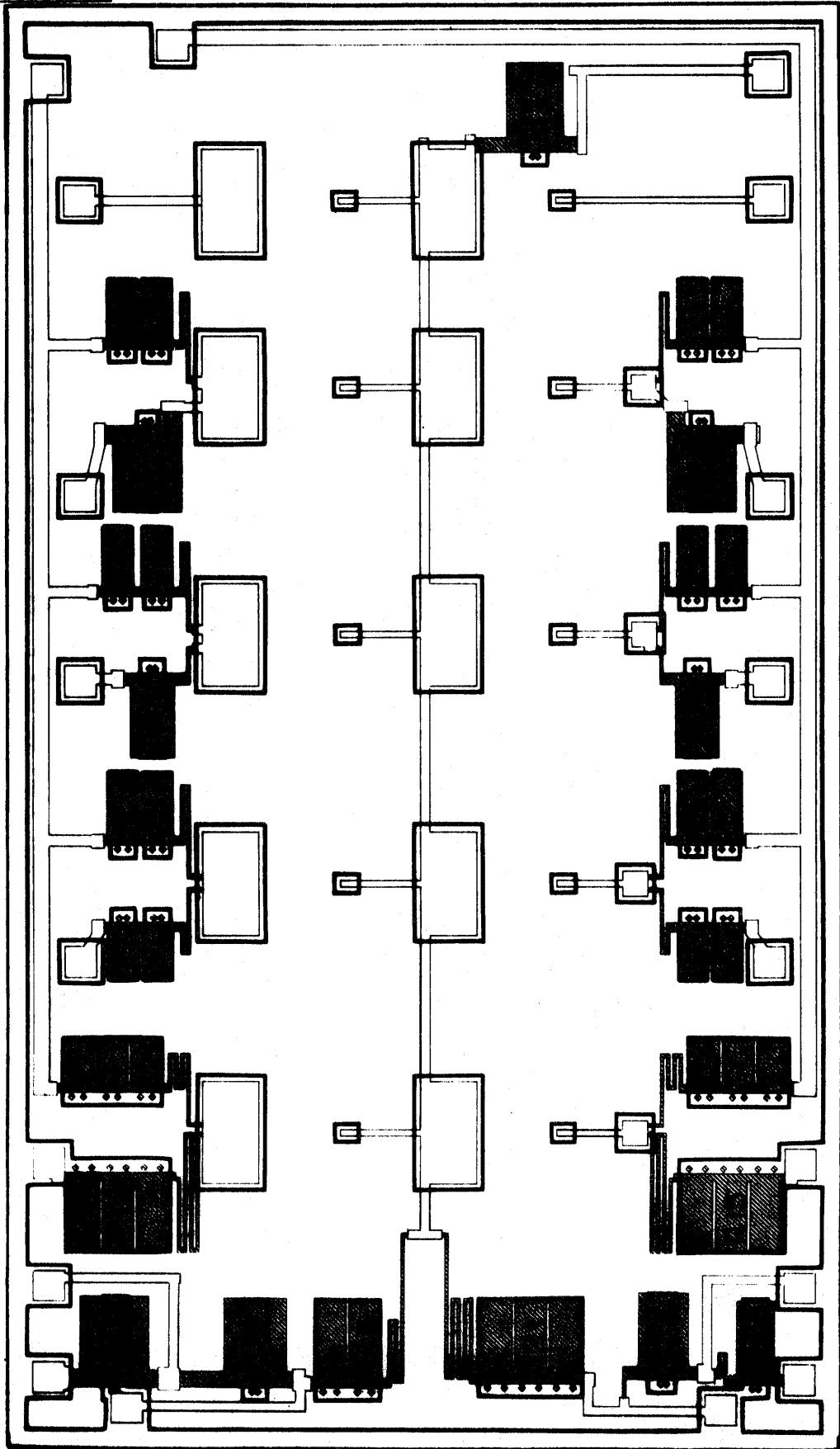
3.0 SCHEMATIC



H789

3.1

Layout Drawing



TEKTRONIX, INC.  
BEAVERTON, OREGON

SHT 4 OF 11

CODE IDENT NO  
**80009**

SIZE  
**A**

PART NUMBER

155-0195-00

REV  
OR

4.0 PARAMETRIC DEFINITIONS

4.1  $V_{EE}$

$V_{EE}$  is the negative reference supply voltage to the divider connected to anodes of diodes D3, D5, D7, and D9 and directly to the anode of D1.

4.2  $V_{CC}$

$V_{CC}$  is the positive reference supply voltage to the dividers connected to the cathodes of diodes D4, D6, D8, and D10 and directly to the cathode of D2.

4.3  $V_{IN}$

$V_{IN}$  is a triangular waveform input.

4.4  $T_R$

$T_R$  is the risetime from -peak input voltage to +peak input voltage.

4.5  $T_F$

$T_F$  is the fall time from +peak input voltage to -peak input voltage.

4.6  $T_T$

$T_T$  is the transition time from the linear portion of the rise to the linear portion of the fall of the input wave form.

5.0 PARAMETRIC SUMMARY

NO	SYMBOL	PARAMETER/CONDITIONS	MIN	MAX	UNITS
1	$V_{EE}$	Reference voltage, negative, Pins 16, 17, 19, 20, and 22	-3.01	-2.99	V
2	$V_{CC}$	Reference voltage, positive, Pins 3, 5, 6, 8, and 9	2.99	3.01	V
3	$V_{EE}/V_{CC}$	Match, reference voltages	.995	1.005	NA
4	$V_{IN}$	Input voltage, Pin 23	-6.02	-5.98	V
			+5.98	+6.02	V
		Match, input voltages	.990	1.01	NA
5	$T_R/T_F$	Input waveform ratio of rise-time to fall time	.998	1.002	--
6	$R_{LOAD}$	Load resistance	0	30	$\Omega$
7	$I_{11} + I_{13}$	Terminals 11 and 13 connected in parallel. $I_0 = 951 \mu A \pm 2\%$	$= I_0 \sin \left( \frac{\pi}{12} V_{IN} \right)$		
8	$\frac{I_{10} + I_{15}}{I_{11} + I_{13}}$	Ratio of current for PAL connections to current for NTSC connections	.99589	1.00088	NA
9	$\frac{I_{12} + I_{14}}{I_{11} + I_{13}}$	Ratio of current for PAL M connections to current for NTSC connections.	.99597	1.00097	NA
10	$\frac{I_{13}}{I_{11}}$	Ratio of output current Pin 13 to output current Pin 11	.66536	.66869	NA
11	$\frac{I_{15}}{I_{10}}$	Ratio of output current Pin 15 to output current Pin 10	.59830	.60130	NA
12	$\frac{I_{14}}{I_{12}}$	Ratio of output current Pin 14 to output current Pin 12	.49920	.50170	NA

5.0 PARAMETRIC SUMMARY (continued)

NO	SYMBOL	PARAMETER/CONDITIONS	MIN	MAX	UNITS
13		Output waveform, total harmonic distortion at 1 Hz		-46	dB
14		Output waveform, no single harmonic shall exceed at 5 MHz		- 46	dB
15		Output waveform, no single harmonic shall exceed at 10 MHz		- 40	dB
16		Output waveform, no single harmonic shall exceed at 20 MHz		- 30	dB
17	T <sub>0</sub>	Operating Temperature	0	+75	Deg C
18	MTTF	Reliability	300K	NA	Hours

5.1 Connection Table

The connection table for output as related to the mode of operation for the instrument in which the hybrid is used.

MODE	LEVEL	PIN #
NTSC	Full	11
NTSC	Reduced	13
PAL	Full	10
PAL	Reduced	15
PAL M	Full	12
PAL M	Reduced	14

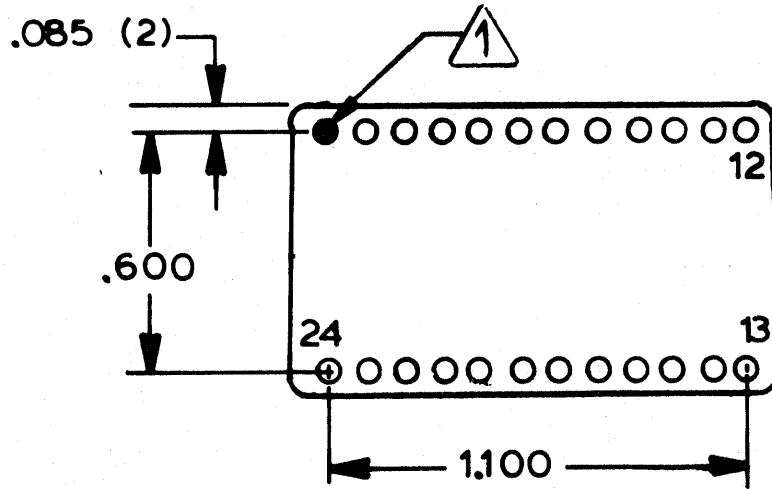
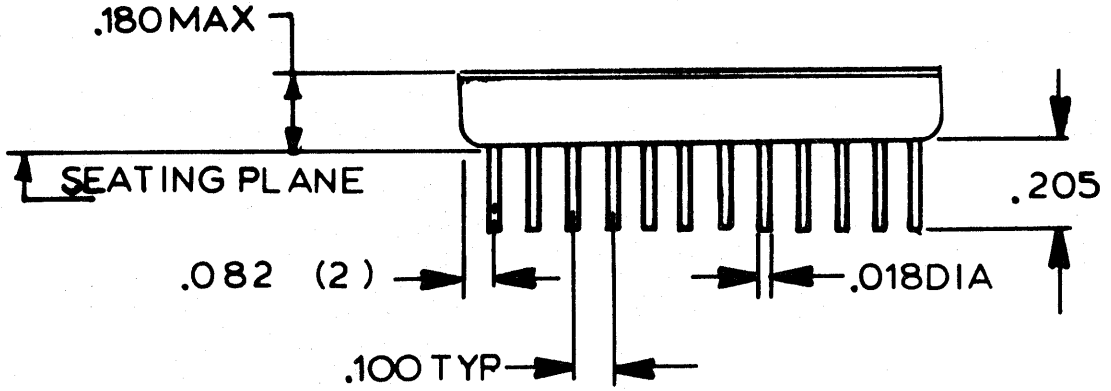
6.0 PACKAGING

6.1 Terminal Identification

PIN #	NAME	INPUT/OUTPUT	DESCRIPTION
1	GND-	Supply	Ground connection for -ref dividers
2	GND+	Supply	Ground connection for +ref dividers
3	V <sub>CC+</sub>	Supply	+Ref voltage for cathode of D2
4		NC	
5	V <sub>CC2+</sub>	Supply	+Ref voltage for cathode divider D4
6	V <sub>CC3+</sub>	Supply	+Ref voltage for cathode divider D6
7		NC	
8	V <sub>CC4+</sub>	Supply	+Ref voltage for cathode divider D8
9	V <sub>CC5+</sub>	Supply	+Ref voltage for cathode divider D10
10	IO,10	Output	Current output, 5950 Ω, refer to output connection table
11	IO,11	Output	Current output, 6190 Ω, refer to output connection table
12	IO,12	Output	Current output, 5580 Ω, refer to output connection table
13	IO,13	Output	Current output, 9280 Ω, refer to output connection table
14	IO,14	Output	Current output, 11,150 Ω, refer to output connection table
15	IO,15	Output	Current output, 9920 Ω, refer to output connection table
16	V <sub>EE5-</sub>	Supply	-Ref voltage for anode divider D9
17	V <sub>EE4-</sub>	Supply	-Ref voltage for anode divider D7
18		NC	
19	V <sub>EE3-</sub>	Supply	-Ref voltage for anode divider D5
20	V <sub>EE2-</sub>	Supply	-Ref voltage for anode divider D3
21		NC	
22	V <sub>EE1-</sub>	Supply	-Ref voltage for anode divider D1
23	V <sub>IN</sub>	Input	Input Signal Connection
24		NC	



6.1 Outline Drawing



6.3 Thermal Characteristics

For .050 watts applied average power;

$\Delta T_{J\text{-substrate}}$	. . . . .	0.1%
$\Delta T_{\text{Substrate-ambient}}$	. . . . .	2.7°C
$\Delta T_{J\text{-ambient}}$	. . . . .	2.8°C
$\Delta T_{J \text{ Maximum}} (T_{\text{ambient}} = 70^\circ\text{C})$	. . . . .	72.8°C

7.0 RELIABILITY STATEMENT

7.1 Reliability Goal (Minimum) As of August 21, 1978

$\lambda$ , Failure Rate  $\leq$  .33%/1K Hours at 70°C  $T_j$

MTTF  $\geq$  300K Hours at 70°C  $T_j$

7.2 Life Test Results

90% Confidence Level

$\lambda$ , .33%/1K Hours at 70°C  $T_j$

Life Test Report #RA41

8.0 APPLICATIONS INFORMATION

- 8.1 The device is considered to be susceptible to static damage and should be handled accordingly.
- 8.2 This circuit was first used in the TSG6 to convert a triangle waveform into a sinewave with low harmonic distortion.
- 8.3 The diodes in this circuit are operated near the limit of their reverse voltage capability so caution must be used to avoid exceeding the rated limits on supply and input voltages.
- 8.4 Any condition that will place a reverse voltage stress of greater than 7 volts or reverse current of greater than 1  $\mu$ A on the diodes should be avoided.
- 8.5 The power dissipated in this circuit is quite low so special consideration for cooling is not deemed necessary.

NOTE: Contact TPM (Technical Products Management) in Integrated Circuits Manufacturing BEFORE using this device in any new applications.

9.0 REFERENCE LIST

<u>SPEC #</u>	<u>TITLE</u>	<u>SOURCE</u>
307-1120-02	Trimmed Resistor Network	MCG Documentation