

Example: A PIN Diode π Network for TV Tuners. The since-discontinued TDA1053 is an example of an integrated PIN π network attenuator intended for TV-tuner use. It comprises three silicon planar PIN diodes connected to form a π network (Figure 2-27) and serves for the electronic amplitude control of the input signals of TV tuners and antenna distribution amplifiers in the 40–1000-MHz range. Its input and output impedances remain constant over the entire control range. This can also be achieved with discrete diodes.

The TDA1053 was normally supplied with vertical leads. The characteristics stated below apply to devices of this configuration.

MAXIMUM RATINGS OF INDIVIDUAL DIODES

Reverse voltage	V_R	30	V
Forward current at $T_{amb} = 25^\circ\text{C}$	I_F	50	mA
Junction temperature	T_j	125	$^\circ\text{C}$
Storage temperature range	T_s	-55 to +125	$^\circ\text{C}$

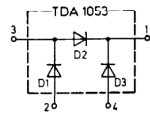


Figure 2-27 Internal circuitry of the TDA1053.

152 MODELS FOR ACTIVE DEVICES

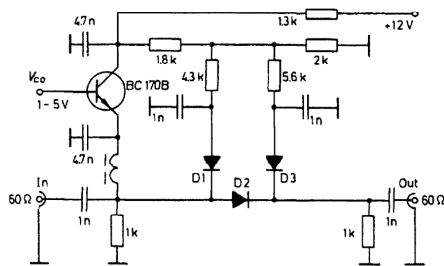


Figure 2-28 Test and application circuit.

MAXIMUM RATINGS OF THE π NETWORK

Ambient operating temperature range when operating according to Figure 2-28	T_{amb}	100	$^\circ\text{C}$
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CHARACTERISTICS OF INDIVIDUAL DIODES AT $T_{amb} = 25^\circ\text{C}$

Forward voltage at $I_F = 50\text{ mA}$	V_F	< 1.2	V
Forward current at $V_R = 15\text{ V}$	I_R	< 500	nA
Differential forward resistance:			
At $I_F = 10\text{ mA}, f = 100\text{ MHz}$	r_f	5	Ω
At $I_F = 10\text{ }\mu\text{A}, f = 100\text{ MHz}$	r_f	1.4	k Ω

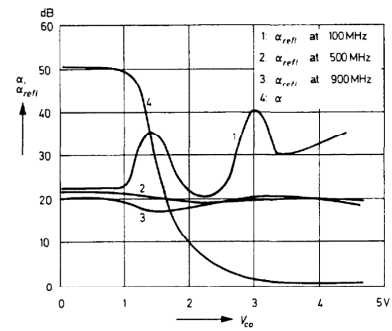


Figure 2-29 Attenuation and reflection attenuation versus control voltage.

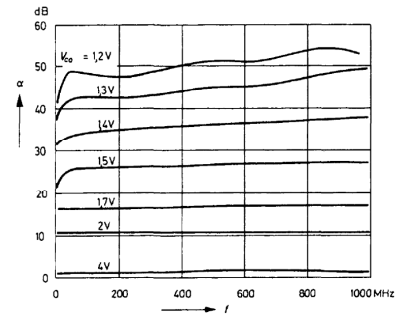


Figure 2-30 Attenuation versus frequency.

CHARACTERISTICS IN THE TEST CIRCUIT (FIGURE 2-28) AT $T_{amb} = 25^\circ\text{C}$

Voltage for 1% cross-modulation	V_{cr}	1	V
Attenuation in the 40–1000-MHz range ¹³³⁹⁶⁷¹⁷			
At $V_{co} = 1.5\text{ V (1–2 V)}$	a_{max}	45 (> 36)	dB
At $V_{co} = 5\text{ V (4–5 V)}$	a_{min}	1.5 (< 2)	dB
Reflection coefficient in the 40–1000-MHz range over the entire control range, depending on circuit design	a_{refl}	20 (> 16)	dB

These data reveal that the compact design of the three PIN diodes in a common 50B4 plastic package guarantees favorable values for minimum and maximum attenuation, as well as reflection attenuation. The test and application circuit shown in Figure 2-28 also comprises the transistor control-signal amplifier. The typical characteristic of the attenuation and the reflection attenuation for this circuit are shown in Figure 2-29, as a function of the control voltage V_{co} . Figure 2-30 shows the attenuation at different control voltages, as a function of frequency.