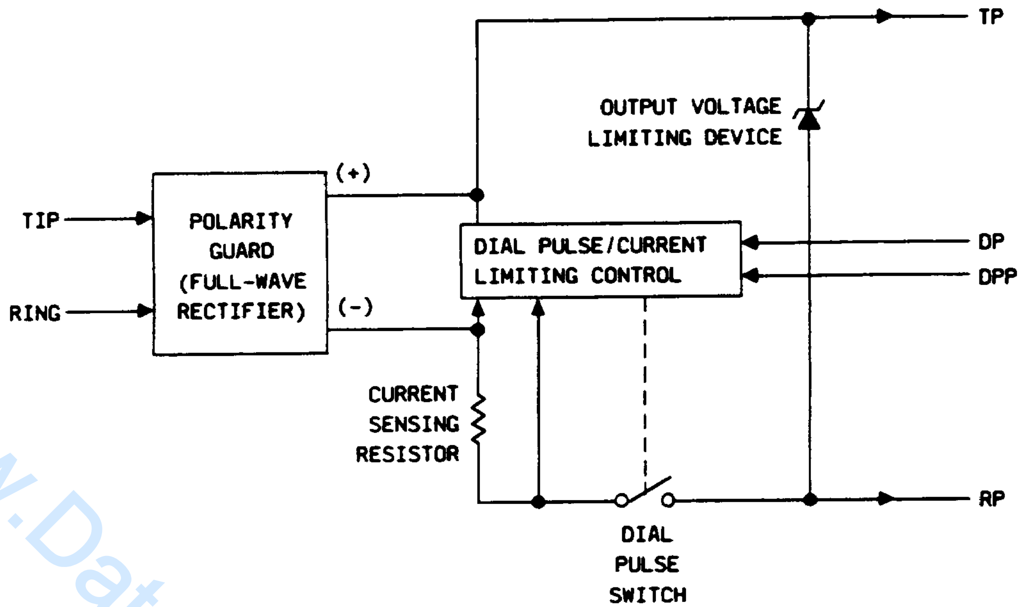
Description

The LH1028BB Telephone Interface Circuit (TIC) is a product fabrication of monolithic high-voltage BCDMOS technology and dielectric isolation. This integrated circuit performs the following basic functions: high-voltage dial-pulse switching, protection against reversal of TIP-RING polarity from the Central Office, and overvoltage/overcurrent protection of telephone circuits.

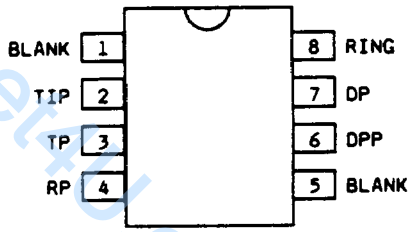
Features

- Withstands telephone loop voltages to 155 V
- Operates at low TIP-RING voltages (typically as low as 2.7 V)
- Minimal internal voltage drop across polarity guard
- Monolithic solid-state construction allows for greater reliability and physical area conservation

Functional Diagram



Pin Diagram



Maximum Ratings

At 25 °C

Stresses exceeding the values listed under Maximum Ratings may cause permanent damage to the device. This is an absolute stress rating only. Functional operation of the device at these or any other conditions in excess of those indicated in the operational sections of this data sheet is not implied. Exposure to maximum-rating conditions for extended periods of time may adversely affect device reliability.

Rating	Value	Unit
Ambient Operating Temperature Range	0 to 50	°C
Storage Temperature Range	−40 to +125	°C
Pin Soldering Temperature (t = 15 s max.)	300	°C
Voltage, (TIP-RING)	155	V
Power Dissipation (Package Limitation)	750	mW

Pin Description

Pin	Symbol	Name/Function
1 5	BLANK	These pins may be used as a tie point for external components. Voltages applied to these pins should not exceed 155 V.
2	TIP	Input from TIP terminal of central office.
3	TP	TIP Prime. Positive output of the polarity guard (see Functional Diagram).
4	RP	RING Prime. Negative output of the polarity guard (see Functional Diagram).
6	DPP	Dial-pulse control voltage is applied between Dial Pulse (DP) and Dial-Pulse Prime (DPP) pins. See APPLICATIONS for a functional description of this control voltage.
7	DP	Dial-pulse. Control pin for internal dial-pulse switching.
8	RING	Input from RING terminal of central office.

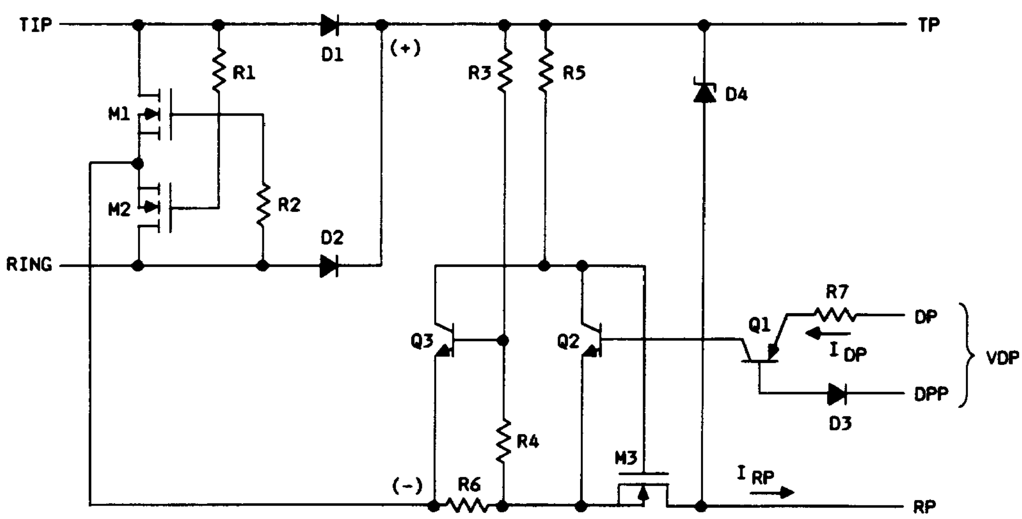


Figure 1. Simplified Schematic Illustrating Symbology of Characteristics

Testing Description (At 25 °C unless otherwise specified)

CHARACTERISTIC	TEST CONDITION	MIN	MAX	UNIT
Breakdown Voltage (TIP-RING)	Figure 2; V_{DP} = 2.0 V, R_L = 1000Ω, Increase V_{T-R} until I_{T-R} = 3.0 mA	155	—	V
Off-State Leakage	Figure 2; V_{DP} = 2.0 V, R_L = 200 Ω, V_{T-R} = 78.8 V, Measure I_{T-R}	—	1.0	mA
Current Limiting	Figure 2; V_{DP} = 0.65 V, R_L = 40 Ω, V_{T-R} = 12 V, Measure I_{T-R}	155	—	mA
TIP-RING Operating Voltage	Figure 3; V_{DP} = 0.65 V, R_L = 400 Ω, I_{T-R} = 4.0 mA, Measure V_{T-R}	—	2.9	V
On-State Voltage	Figure 3; V_{DP} = 0.65, R_L = 200 Ω, I_{T-R} = 20 mA, Measure V_{T-R} minus V_{OUT}	—	1.3	V
Dial-Pulse Control Voltage (Note 1)	Figure 4, I_{DP} = 5.0 μA, R_L = 200Ω, V_{T-R} = 78.8 V, I_{T-R} < 1,0 mA, Measure V_{DP}	—	2.0	V
Dial-Pulse Input Current	Figure 4, V_{DP} = 2.0 V, R_L = 200 Ω V_{T-R} = 78.8 V, I_{T-R} < 1.0 mA, Measure I_{DP}	—	25.0	μA
Output Voltage	Figure 5, V_{T-R} = 140 V_{peak}, Measure V_{OUT}	—	29.0	V_{peak}
Turn-On Time	Figure 6, R_L = R1 = 200Ω, V_{TP} = 78.8 V, V_{DP} = 2.0 V initially. Turn-On Time is the time for the voltage across R1 (V_{R1}) to reach 57.5 after V_{DP} is switched to zero.	—	500	μs
Turn-Off Time	Figure 6, R_L = R1 = 200Ω, V_{TP} = 78.8 V, V_{DP} = zero initially. Turn-Off Time is the time for the voltage across R1 (V_{R1}) to decrease to 6.4 V after V_{DP} is switched to 2.0 V.	—	500	μs

Testing Circuits

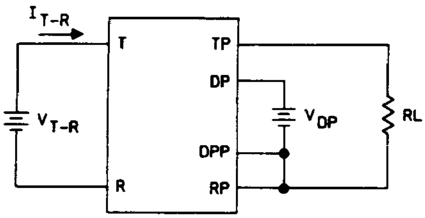


Figure 2. Test Circuit

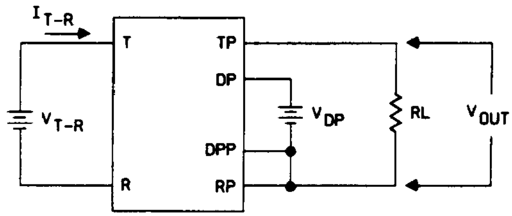


Figure 3. Test Circuit

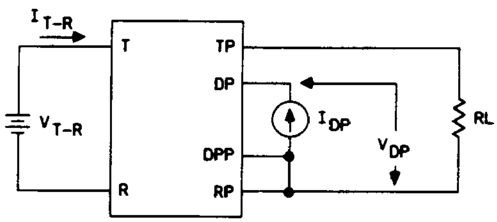


Figure 4. Test Circuit

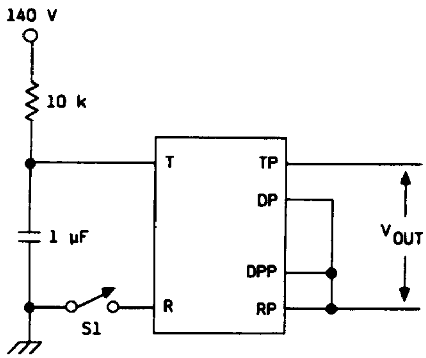
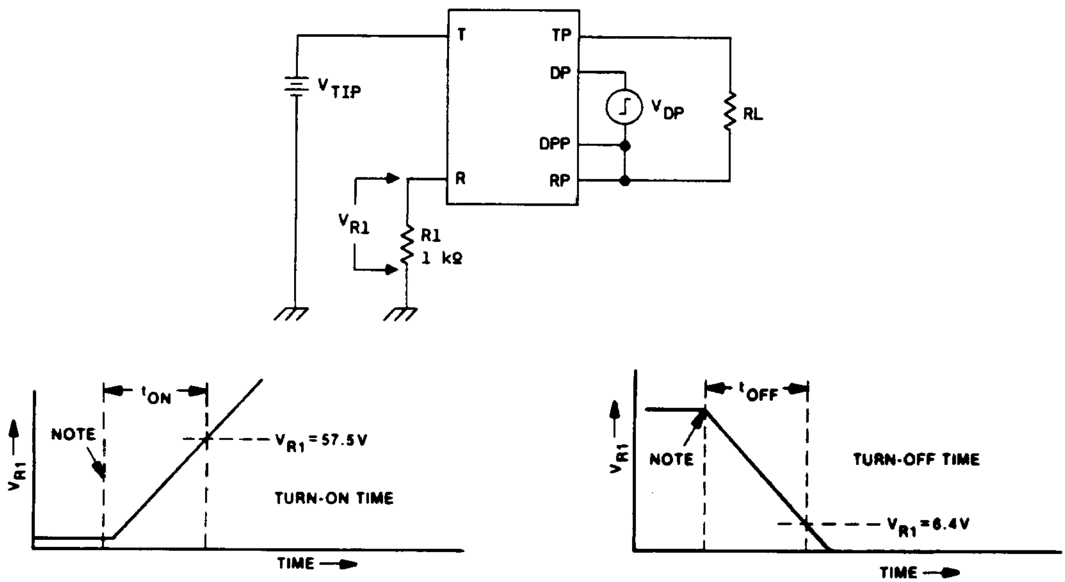


Figure 5. Test Circuit



NOTE: Time at which DP is shorted to DPP.

NOTE: Time at which VDP = 2.0 V

Figure 6. Switching Time Test Circuit

Applications

Figure 7 is a block diagram representing a telephone set application using the LH1028BB Telephone Interface Circuit (TIC). The incoming signal first passes through a switchhook before being connected to the TIC input terminals pin 2 (TIP) and pin 8 (RING). A metal-oxide varistor (MOV) or similar device shunts the input terminals of the TIC and limits the voltage across these terminals to less than 155 V. This protection is needed to prevent the TIC input from exceeding its maximum voltage rating.

The output terminals of the TIC are TIP Prime (TP) and RING Prime (TP). TP is the positive output side of the polarity guard (full-wave rectifier). The RP terminal is connected to the negative side of the polarity guard by an internal dial pulse switch (M3, Figure 1) which is opened by applying a voltage between the control terminal Dial Pulse (DP) and Dial Pulse Prime (DPP).

The Set Electronics are attached to output pin 3 (TP) and pin 4 (RP). All of the audio functions, touch-tone dialing, dc characteristics control, logic and memory (if required) are contained in this external circuitry. If these circuits normally obtain their operating power from the telephone line through the TIC, they must have a temporary source of power to keep them working during the dial-pulse switch opening. This can usually be achieved using the charge provided by a storage capacitor. The operation of the LH1028BB TIC's primary functions, i.e., polarity guard, dial-pulse switching, and overload protection are described in more detail in an Application Note.

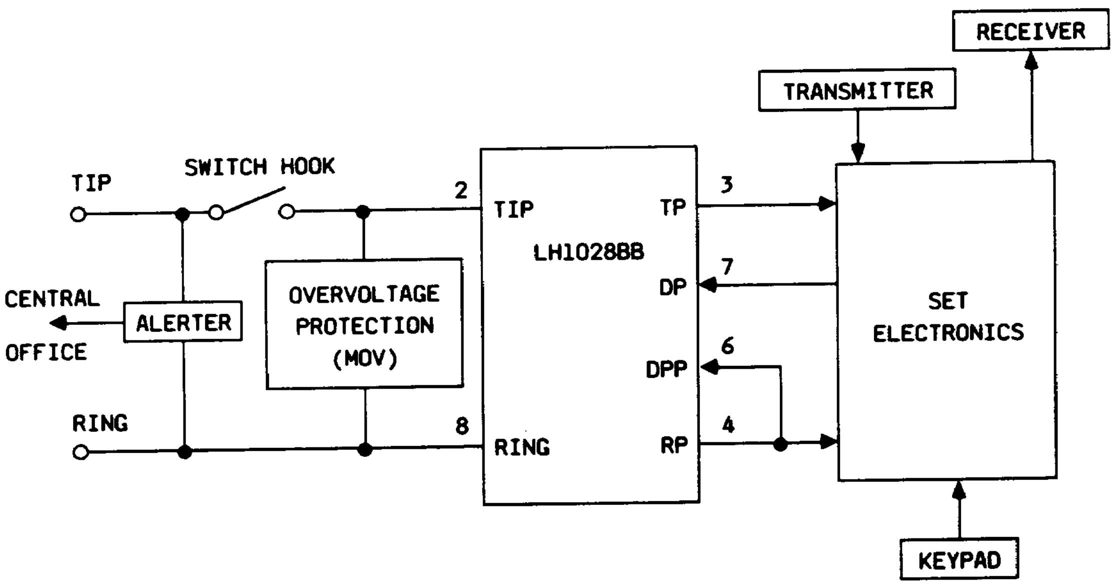


Figure 7. Typical Telephone Set Configuration

Characteristics

The dc characteristics of the LH1028BB TIC are shown in Figure 8. The RP, DP and DPP terminals are shorted and a 40 Ω load is between TP and RP. Also shown in Figure 8 is a load curve representing the central office battery and loop resistance. Note that the loop load intersects the TIC characteristics in a region where the drain current of M3 (Figure 1) is limited only by the 40 Ω load and not by the current limiting feedback current in the device. If the characteristic of the LH1028BB TIC current limiting circuit had a slope such that it intersected the loop load curve, it would be possible for the TIC to "latch up" in this higher voltage state and fail to operate properly. For this reason, the current limiting curve of the TIC has been designed to always be above, and almost parallel to, the worst case loop load curve.

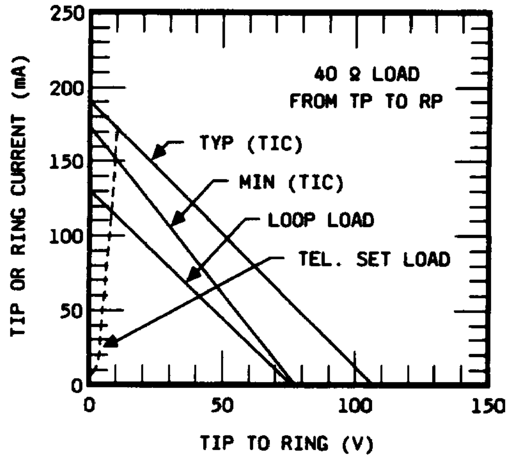
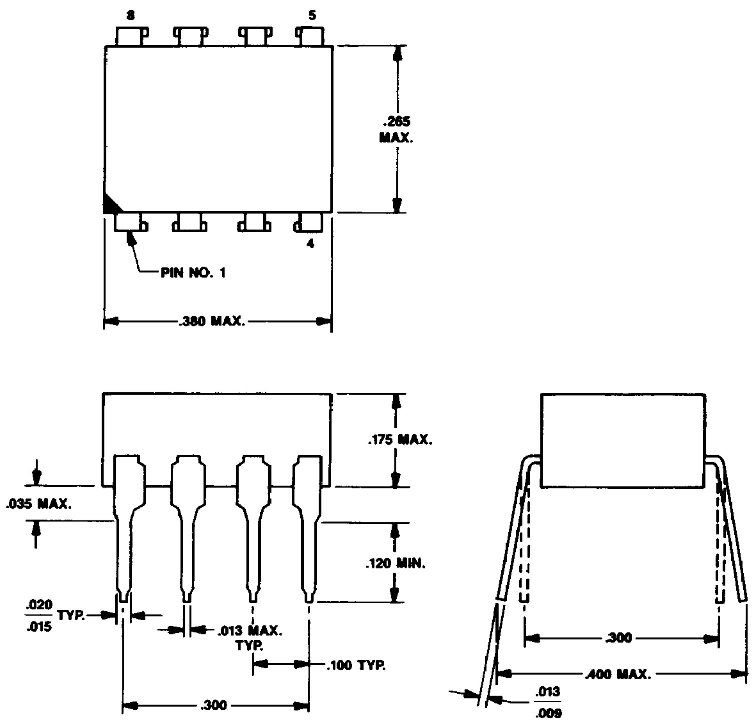


Figure 8. Current-Voltage Relationships

Outline Drawings (Dimensions in Inches)



Ordering Information

Device	Comcode
LH1028BB	104384474