

FEATURES

- Low voltage drop polarity guard (1.4 V max at 20 mA), ideal for line-powered DAA circuits
- On-chip protection for associated DAA circuitry
- Isolated switchhook, suitable for pulse dialing
- Three functions integrated into one package, ideal for space-constrained applications
- Isolation in excess of 3750 Vrms to facilitate meeting domestic and foreign regulatory requirements
- Easy interface to AT&T and other DAA circuits
- Ideal for use in modems, answering machines, FAX machines, and other customer premises equipment

APPLICATIONS

- Modems
- FAX machines
- Answering machines
- Key telephone systems
- Equipment attached to the customer premises side of the telephone line

DESCRIPTION

The LH2559 High-Voltage Interface IC is an integrated high-voltage switch that contains a solid-state switchhook relay, a low-voltage drop polarity guard, and a protection circuit across the outputs.

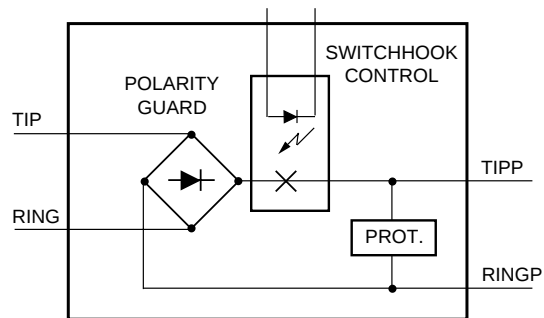
The solid-state switchhook relay is an optically coupled, low ON-resistance, MOSFET device. The 8-pin DIP/SOG version has an insulating barrier of 3750 Vrms. This device has a voltage breakdown rating of 400 V.

A feature of this device is the polarity guard. A combination of diodes and MOSFETs provides for a low-voltage drop on long loops. The maximum voltage drop across both the polarity guard and the solid-state switchhook relay is only 1.4 V at 20 mA.

The 18 V protection circuit is provided to ensure the integrity of coupled low-voltage DAA circuitry, such as AT&T's ATTD2560 Interface Circuit for Optically Coupled Data Access Arrangements.

The LH2559 is packaged in an 8-pin DIP (LH2559AB) or in an 8-pin surface-mount gull-wing package (LH2559AAC).

Figure 1. Functional Block Diagram



Pin Information

Figure 2. 8-Pin DIP Diagram for LH2559

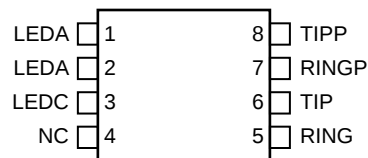


Table 1. PIN Descriptions for 8-Pin DIP/SOG Package

DIP/SOG	Symbol	Description
1	LED A	The anode side of the LED that controls the switch.
2	LED A	The anode side of the LED that controls the switch.
3	LED C	The cathode side of the LED that controls the switch.
4	NC	No connection. Do NOT use as tie points.
5	RING	Ring conductor of the incoming telephone line.
6	TIP	Tip conductor of the incoming telephone line.
7	RINGP	Ring conductor of the telephone line on the user side of the polarity guard. This is a polarized RING conductor, negative with respect to TIPP.
8	TIPP	Tip conductor of the telephone line on the user side of the switchhook. This is a switched and polarized positive TIP conductor.

Functional Description

As shown in Figure 1, the LH2559 contains three functional blocks: a solid-state switchhook relay, a polarity guard, and a protection circuit.

The switchhook function is performed by using an isolated MOSFET switch that has an ON-resistance of approximately 7 Ω . This switch is controlled by an optically coupled, isolated relay-driver circuit. The relay-driver circuit is controlled by the LED input pins. When current is applied to the LED, the switch goes to an off-hook condition. The LED has an input/output isolation of 3750 Vrms, and the MOSFET switch has a breakdown voltage of 400 V. These parameters will easily meet the isolation/breakdown requirements of many regulatory agencies.

The polarity guard functions as a diode bridge, always biasing the TIPP lead positive with respect to the RINGP lead. A combination of MOSFETs and diodes is used to reduce the forward voltage drop through the device (including the switchhook) to 1.4 V maximum at 20 mA. This allows a full 4.6 V to be available to the other DAA circuitry on the equipment side of the switchhook and while still meeting the requirements of FCC Part 68 on a long loop. The device also contains an internal 18 V protection circuit to protect external equipment connected to the outputs of the device during the off-hook state.

Absolute Maximum Ratings (At 25°C)

Stresses in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in

excess of those indicated in the operational sections of the data sheet. Exposure to Absolute Maximum Ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Value	Unit
Power Supply	V_{SS}	5 V $\pm$ 10%	V
Ambient Operating Temperature Range	T_A	0 to 70	°C
Pin Soldering Temperature: (t=10 s max) 8-pin DIP/SOG	T_S	260	°C
Input/Output Isolation Voltage: (t=60 s min) 8-pin DIP/SOG	V_{ISO}	3750	Vrms
Breakdown Voltage TIP—TIPP	V_{BD}	400	V
LED Input Ratings: Continuous Forward Current Reverse Voltage ($I_R \leq 10 \mu A$)	I_F V_R	50 5	mA V

Electrical Specifications (T_A=25°C)

Minimum and maximum values are testing requirements.
Typical values are characteristics of the device and

are the result of engineering evaluations. Typical values
are for information purposes only and are not part of the
testing requirements.

Table 2. Device Characteristics

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Off-state Leakage Current	I _{TIPP}	I _F =0 mA, V _{TIP} =400 V, V _{RING} =0 V, TIPP and RINGP tied together	—	—	16	μA
Total ON-resistance	R _{ON}	I _F =5 mA, I _{TIP} =30 mA, V _{RING} =0 V R _{ON} =[V (50 mA) – V (20 mA)] ÷ 30 mA TIPP and RINGP tied together	12	—	24	Ω
Total On-state Voltage	V _{TIP}	I _F =5 mA, I _{TIP} =20 mA, V _{RING} =0 V, TIPP and RINGP tied together	—	—	1.4	V
Turn-on Time	t _{on}	V _{TIPP} =0 V, V _L =50 V, TIP=R _L , R _L =1 kΩ, I _F =step from 0 mA to 5 mA	—	—	5	ms
Turn-off Time	t _{off}	V _{TIPP} =0 V, V _L =50 V, TIP=R _L , R _L =1 kΩ, I _F =step from 5 mA to 0 mA*	—	—	5	ms
Breakdown Voltage	V _{BD}	I _F =0 mA, Voltage applied between TIP and RING, TIPP and RINGP tied together	400	—	—	V
Isolation Voltage: 8-pin DIP/SOG	—	Between pins 1—4 and 5—8	3750	—	—	V _{rms}
LED Forward Current for Switch Turn-on	I _{FON}	I _{TIP} =100 mA, t=5 ms	—	0.2	5	mA
LED Forward Current for Switch Turn-off	I _{FOFF}	V _{TIP} V _{TIPP} =400 V, t=5 ms	0.01	0.1	—	mA
LED Forward Voltage	V _F	I _F =10 mA	1.15	1.26	1.45	V
LED Reverse Breakdown Voltage	V _{LBD}	—	5	—	—	V
Protection Voltage	V _{PROT}	—	16	18	20	V

*V_L is a power supply connected to the TIP pin through a resistance R_L.