Applications of the Zarlink SLIC Devices
SLIC DA/DB Internal Circuit

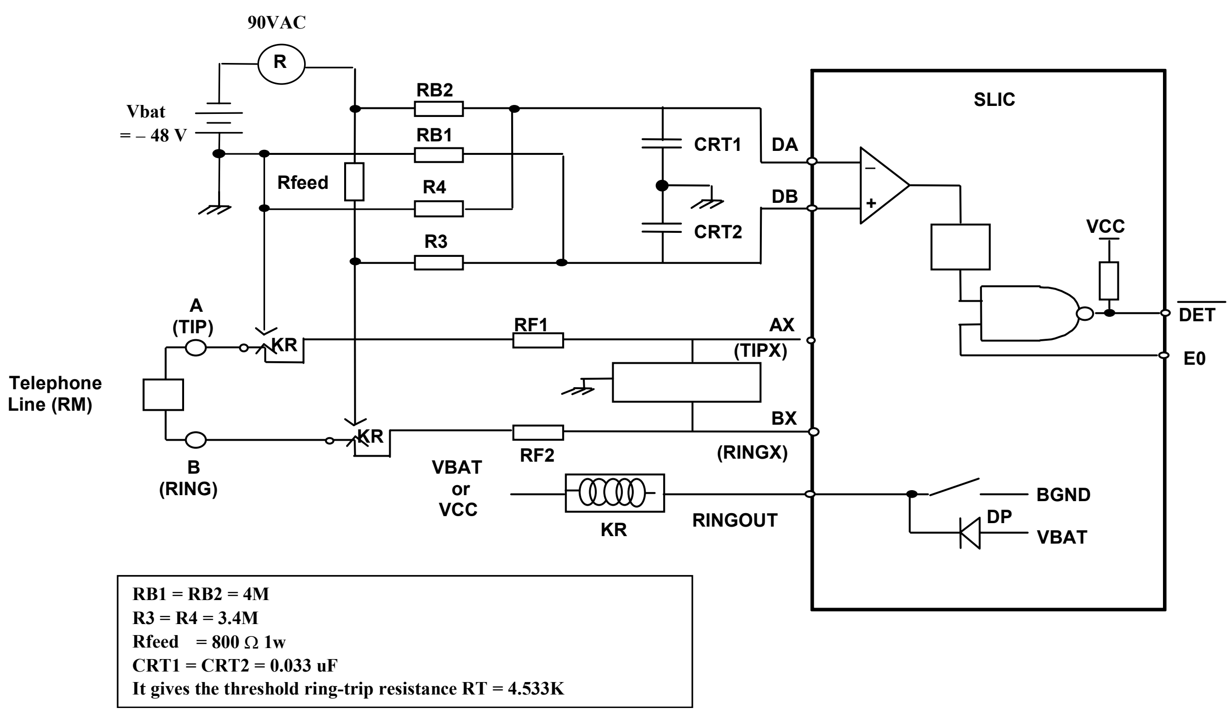
Application Note

APPLICATION NOTE

Several of Zarlink's SLIC products offer DA/DB pins that allow external input signals to be applied to the SLIC. These pins allow the user to connect to off-board custom-built ringing circuitry.

An example of the type of circuitry recommended is similar to what is shown in Figure 1.

Figure 1. External Ringing Circuitry



This allows operation in half-battery, with a DA/DB delta of –1.8 V when on-hook.

There are two different internal SLIC configurations of the DA/DB circuitry. These are functionally equivalent when used in a standard application. However, if the ring-trip comparator is used in a different way, different behavior is seen if the voltages at DA and DB operate very close to BGND. The following describes each circuit and the resulting behavior when operating these inputs near to ground.

The following circuitry applies to these devices:

Am7942, Am7943, Am7944, Am7945, Am7946, Am79467, Am79467-X, Am7947, Am7949, Am795xx, and the Am79M5xx.

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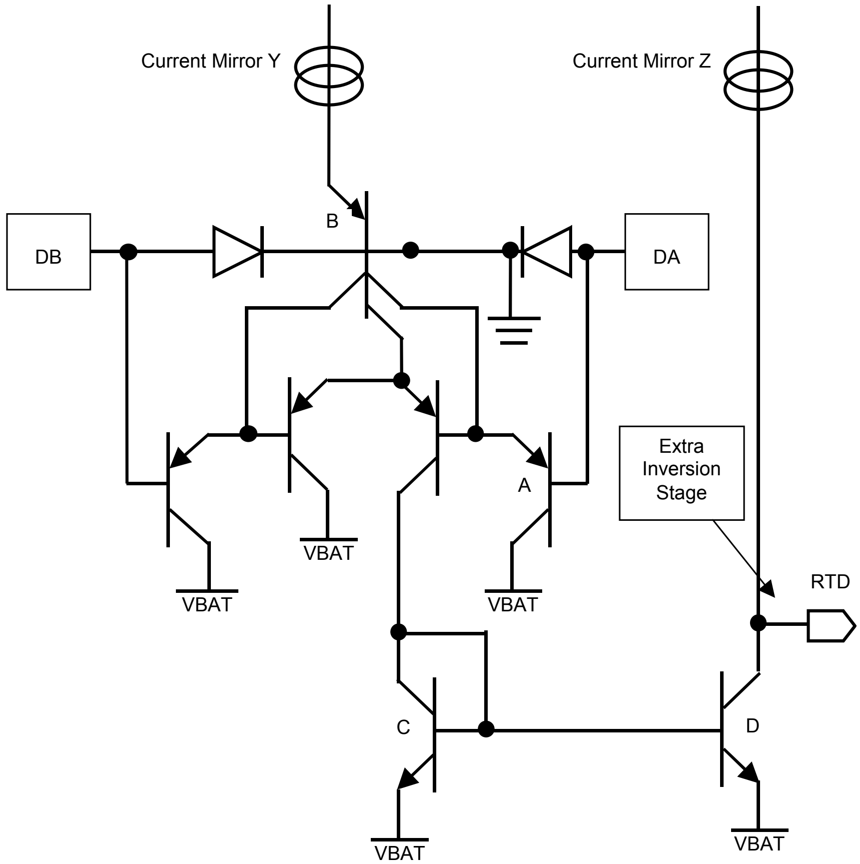
Figure 2. DA/DB Circuitry Internal to SLIC (Newer) Devices



The way this circuit operates is:

During a non-tripped mode:

1. DB is less than DA.
2. The voltage on DB turns on the DB half of this comparator.
3. This forces all the current going through transistor B into transistors A and C.
4. The current mirror formed by transistors C-D shunts all the current from current mirror Z away from “RTD”, preventing a detect signal from occurring.

During a tripped mode:

1. DA is less than DB.
2. The voltage on DA turns on the DA half of this comparator (stealing the current from the DB half).
3. This forces all the current going away from transistors A and C.
4. The current mirror formed by transistors C-D turns “off” and all of the current from current mirror Z goes into “RTD” and generates a detect signal.

Typical Voltage required on DB for circuit to operate at temp = 25°C:

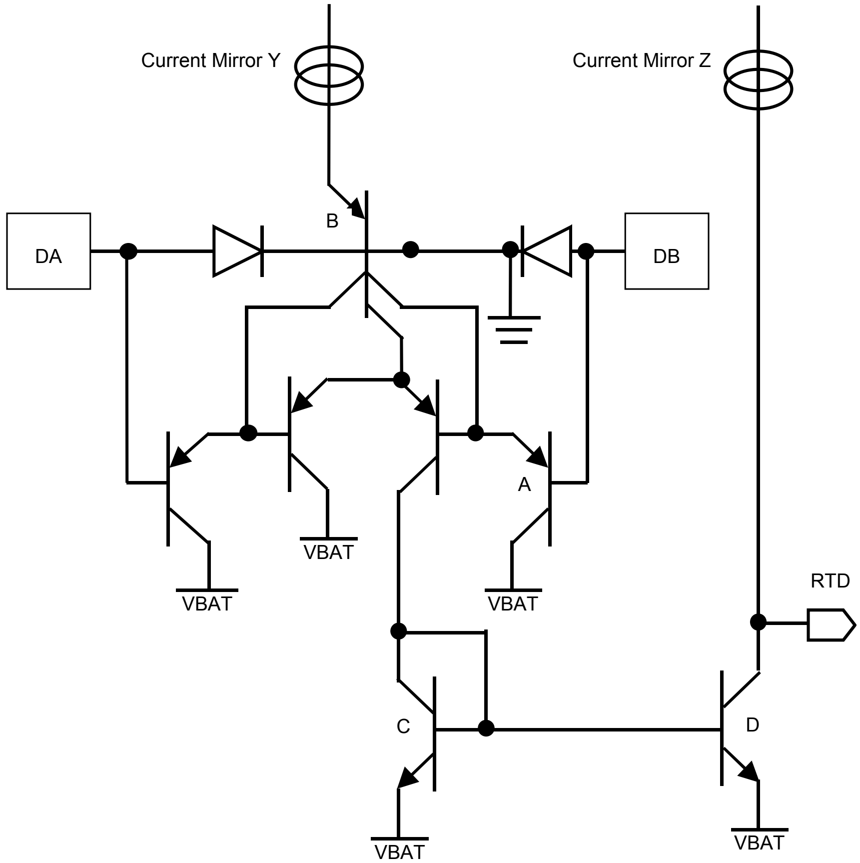
DB < –(VSAT of transistor B) – (VBE of Transistor A) ≅ –(0.20 V) – (0.60 V) ≅ –0.8 V

⇒ Assume –1.00 V with margin for internal IR drops.

The following circuitry applies to these optimized designs:

Am7920, Am7922, Am7924, Am79485, and the Am79489.

Figure 3. DA/DB Circuitry Internal to SLIC (Optimized) Devices



Circuit Operation if DB Does Not Have a Sufficient Negative Voltage

In Figure 3, when DB moves too close to ground, then the DB half of the comparator turns off independent of the voltage on DA. This results in no current flowing in transistor C and the device appearing to ring trip as transistor D is no longer able to shunt the current from mirror Z to ground. The voltage on DA will not affect this behavior. Therefore, these inputs should be operated between –1.25 V and VBAT potential.

The design shown in Figure 2 is less efficient, and produces different behavior when DA and/or DB are close to ground. In these designs, an extra inversion stage was used on the RTD signal, and DA and DB were swapped to obtain the desired operational behavior. This does not change the circuit operation when DA and DB are operating at their typical voltages (near VBAT/2), but does affect operation when DA and DB are operating very near to ground. With this configuration, if DB is held near to ground, then this leg of the comparator turns off. However, if DA is still more positive than DB (true if the inputs are indicating ‘ON HOOK’), then both halves of the comparator are off. There is no current flow in transistors C and D. In this case, there is a further inversion, which means that the SLIC still indicates ‘ON HOOK’. From this point, if DA swings sufficiently negative, then transistor A turns on, producing current flow in C, which will produce an ‘OFF HOOK’ indication, which is the desired result. However, under these conditions, the offset between DB and DA increases, and in reality the turn-on point for DA is now independent of DB.

Even with this design, the same operating range of –1.25 V to VBAT is recommended for DA and DB to ensure correct comparator operation.

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