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Using the 73K222BL in Existing 73K2xxAL Designs

INTRODUCTION

The 73K222BL is the latest member of the K series family of integrated circuits. This modem data pump adds the hybrid circuit and relay driver of the 73K222U to the 73K222AL and reduces the cost and complexity of the design of your modem. In high volume the savings can be more than $1.00 and even more for lower volumes. The use of the new part in an existing design is very straight forward. For new designs the 73K222BL is preferable for most applications that use the normal US PSTN transmit signal levels and receive levels. For leased line or countries using other transmit levels for carrier or DTMF dialing, the 73K222AL may still be a better choice.

ADVANTAGES OF USING THE 73K222BL

The internal hybrid circuit replaces three op amps, 9 resistors, and 7 capacitors in a typical single 5 Volt hybrid design. This is a significant saving in parts and board space, and reduces the chance of problems relating the hybrid in the design. An unrecognized marginal hybrid design can seriously compromise the performance of the modem.

The relay driver can be used to drive either mechanical or solid state relays. It is capable of sinking 35 ma, and is therefore compatible with many mechanical relays. This driver replaces a transistor and resistor in a typical design using mechanical relays. A protection diode in parallel with the relay coil is still recommended.

USING THE 73K222BL IN AN EXISTING 73K222AL DESIGN

Since the 73K222BL is based on the 73K222AL, the internal chip design is basically the same. The pin out is different since there are additional pins for the differential transmit driver and relay driver, but the pin out follows the same order as in the earlier part. The 73K222BL comes in a 32 lead PLCC package instead of the 28 lead packages used in the 73K222AL. The two transmit signals are on adjacent pins. The relay driver is located on the side of the package where the DAA would normally reside.

In most PCB designs, a change to the 73K222BL would involve removing the existing hybrid, relay driver circuit, and K series IC. This will usually free up more than enough room to place the 73K222BL. Since the connections are all located within a pin or two of the same function on the previous part, rerouting the circuit traces is very straightforward. It is then a simple matter to connect TXA1, TXA2, RXA and the OFFHOOK leads to the existing DAA circuitry. The impedance matching resistor, typically 475 Ohms with most transformers, needs to be replaced with a resistor value that gives a nominal transmit level 1 dB lower than the maximum permitted level, which is -9 dBm in the US. This will typically be 600 Ohms.

TDK Semiconductor Corporation, 14351 Myford Road, Tustin, CA 92780-7068
(714) 508-8800, Fax: (714) 508-8877

FIRMWARE

The only firmware changes that would be required concern the hook switch relay driver. The control for the relay driver is bit D4 in the ID register. This bit is the complement to the state of the driver, so writing a ONE to D4 causes the open drain driver to pull low. This is the way we typically drive the relay in our earlier designs, but if you are using a pull up to drive the relay, you will need to change the connections to the relay for proper driver operation.

The firmware and relay driver circuitry can be left alone if you would like to avoid making firmware changes. Many customers use consultants to do firmware development, and may not want to go to the additional expense of hiring a someone for such a minor design change.

FCC TESTING

Since there is little change to the overall design, recertification problems should be minimal. As long as the transmit levels are properly set, Part 68 should not be a problem.

The only other area of concern should be the Part 15 “radiated emissions” testing since the modem data pump is now connected directly to the transformer. Since the modem data pump is no longer buffered by the op amps as with the 73K222AL design, there could be a higher EMI level seen when the modem is configured for FCC Part 15 testing. Since the transmit analog drivers are the same as those used on the 73K222U, no undue problems should be expected. Provision should always be made for components to filter EMI at the TIP and RING connections. These usually consist of capacitors to ground and series ferrite beads. The types and sizes can be adjusted as needed to address specific needs. It is always best to have places for these components even if they are not needed since adding these later would require a new PCB design turn. Part 15 testing is typically more difficult to pass than Part 68 since special equipment is needed to test for emissions. These are not normally available in most product development laboratories, therefore the first notice of emissions problems are during the certification phase. Usually you are given an opportunity to fix any problems that are uncovered during certification testing, and often the lab will assist you as long as there are provisions for the required components.

FUTURE PRODUCTS

2400 bps V.22bis follow-on products to the 73K222BL are in the works, so there is a similar migration path as with the other K series products. Consult your TSC sales representatives for information on their scheduled release. If a 2400 bps design is anticipated, the firmware and hardware design can be done using the 73K222BL and switching to the faster part when it is available. Consult with TSC applications for technical information.

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