APPLICATION NOTE AN-113

TS117 Telecom Switch

SSRS FOR MODEMS

The use of relays in telecom circuits as a lng history. Originally, electromechanical relays were the only vaible solution for these applicatoins. However, as modems, automatic telephone dialers, fax machines and answering machinescontinue to expand in the data processing world, the need for state of the art technology in the form of solid state relays (SSRs) has become apparent.

The SSR offers: High blocking Voltages, High Lod Currents, Low On-Resistance, Fast Switching speeds and Input/Output Isolation of 3750 V_{RMS}, which make them an ideal solutoin for hookswitch, pulse dialing or loop start switching operations.

Essentially, the modem begins in a standby or idle state in which t is disconnected from the telephone line (See figrure 1). connection begins when a ring curretnais detected by the ring detection device (Clare: LDA Series or "TS" Series). This device supplies a ring detection signal to the odem circuit which is used to initiate teh answer response mode. Once the ring detection signal is recognized and has initiate the answer response mode. Once the ring detection signal is recognized and has initiated the answering sequence by generating the ringing indication signal, the modem chip responds with a signal. the off hook signal generated by the modem is used to activate the hookswitch solid state relay (clare: LCA or PLA Series), closing the circuit between th tip and ring wires and connecting the modem to the circuit.

Clare offers a wide range of SSRs for the telecom industry. Form A, B, C, single pole or dual pole devices, detailed specifications of which ar found on pages 91282.

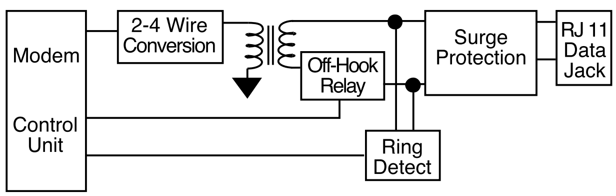

Figure 1. Typical Modem Circuit

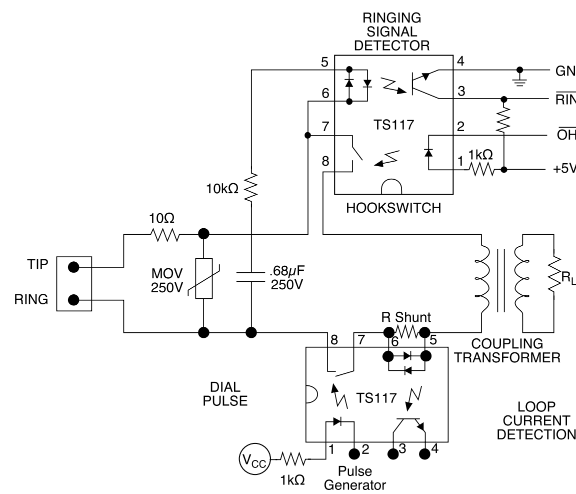

Figure 2. Ring Detector and Loop Detector Circuit

Figure 2 is a typical data access arrangement (DAA) design using Clare's "TS" Series offers an ptically isolated normally open (or normally closed) MOSFET based solid state relay, combined with a bi-directionally driven photo-transistor, all in the same 8 pin DIP.

the Ring Detection portion of this circuit uses a capacitor (typical value .68μF) and a resistor (typical values 10K Ohms) in a series withe the bi-directional LEDs of the TS117, across the Tip and Ring lines of the circuit.

The resistor and capacitor values for the circuit must be chosen to provide sufficient curretn to operate the detector portion of the TS117 at the riquired voltage of the ringer service. (For Class B ringer service voltage range of 40 to $150V_{RMS}$ and frequency range of 15.3 to 68Hz.)

The impedance of this resistor/capacitor network is critical to the Ringer Equivalence Number (REN). the smaller the impedance the larger the REN and if the REN is too large it will limit the number of telephone devices that can be attached to the line.

The TS117 is sensitve to typical loop currents of 2mA alowiing the circuit designer the freedom to program the actual in-circuit triggering current by appropriate choice of input shunt resistance.

Clare's Intergrated Telecom circuit (ITC117P) features combined circuitry in one 16 Pin SOIC package for:

- 1-Form-A Solid State Relay for use as Hookswitch
- Bridge Rectifier
- Darlington Transistor
- Optocoupler that can function as a ring detector or loop current detector

Typical applications for the ITC117P include:

- PCMCIA Designs
- Modem
- Fax
- Voicemail Systems
- Telephone Sets
- Computer Telephony

DESCRIPTION

The ITC series integrates the major components found in a typical Data Access Arrangement (DAA), in a 16 lead SOIC package. As highlighted in figure 1, the 1-Form-A MOSFET SSR,Darlington transistor, bridge rectifier, and optical isolator comprise this integral design. Following is the functional explanation for each device:

Hookswitch

The ITC contains optically-coupled MOSFETs that function as a hookswitch in the DAA circuit. The hookswitch has a blocking voltage up to 350V, isolation voltageto 3750V_{RMS}, 15Ω RDS(on), and a maximum switching current of 120mA, making it ideal for tip and ring switching. The hookswitch is controlled by an LED that requires only 5mA to operate. This makes it an attractive device for battery-powered applicatoins where power consumtion needs to be minimized for prolonged battery life.

Optocoupler

An optocoupler is included in the ITC series package that can be used as a ring detector or loop current detector with the addition of a few passive components. the optocoupleris available with a standard phototransistor or a high gain Darlington transistor.

Bridge/Darlington

Referring to figure 2, a bridge rectifier (D2) and Darlington transistor (Q1) arrangement is inclded in the package for use in "dry" transformer and optical DAA designs. The bridge provides the function of current steeringto maintain DAA operation and protect the Darlington during polarity reversals of a few passive components, functions as an electronic iductor that has the effect of presenting a low resistance to the DC curretn across the telephone line, and a relatively hig empedance for AC signals on the line. For a transformer based design, this enables the designer t use a small coupling transformer (T1) since the telephone loop current is diverted through the Darlington instead passive components, functions as an electronic iductor that has the effect of presenting a low resistance to the DC curretn across the telephone line, and a relatively hig empedance for AC signals on the line. For a transformer based design, this enables the designer t use a small coupling transformer (T1) since the telephone loop current is diverted through the Darlington instead of the transformer windings ("dry transformer"). Without the electronic inductor, the loop current would have to flow through the transformer ("wet transformer"), however since the telehone loop current can be as high as 120mA, the transformer would saturate, causing signal degradation unless the geopety of the transformer becomes much larger. This is especially true for high speed modems such as V.34bis, where return loss must meet or exceed 25dB. Return loss of 25dB is usually not attainable witha wet transformer, and if it is, the transformer is too large and expensive for the application. *The best way to overcome this sauration and return loss problem is to "rerout" the loop current through the electronic inductor and AC couple and modem signal via C2 to the transformer, such that no DC current flows through the transformer. Return loss is a measure of mismatch

CLARE LOCATIONS

Clare Headquarters
78 Cherry Hill Drive
Beverly, MA 01915
Tel: 1-978-524-6700
Fax: 1-978-524-4900
Toll Free: 1-800-27-CLARE

Clare Micronix Division
145 Columbia
Aliso Viejo, CA 92656-1490
Tel: 1-949-831-4622
Fax: 1-949-831-4628

Clare Switch Division
4315 N. Earth City Expressway
Earth City, MO 63045
Tel: 1-314-770-1832
Fax: 1-314-770-1812

SALES OFFICES

AMERICAS

Americas Headquarters
Clare
78 Cherry Hill Drive
Beverly, MA 01915
Tel: 1-978-524-6700
Fax: 1-978-524-4900
Toll Free: 1-800-27-CLARE

Eastern Region
Clare
603 Apache Court
Mahwah, NJ 07430
Tel: 1-201-236-0101
Fax: 1-201-236-8685
Toll Free: 1-800-27-CLARE

Central Region
Clare Canada Ltd.
3425 Harvester Road, Suite 202
Burlington, Ontario L7N 3N1
Tel: 1-905-333-9066
Fax: 1-905-333-1824

Western Region
Clare
1852 West 11th Street, #348
Tracy, CA 95376
Tel: 1-209-832-4367
Fax: 1-209-832-4732
Toll Free: 1-800-27-CLARE

Canada
Clare Canada Ltd.
3425 Harvester Road, Suite 202
Burlington, Ontario L7N 3N1
Tel: 1-905-333-9066
Fax: 1-905-333-1824

EUROPE

European Headquarters
CP Clare nv
Bampslaan 17
B-3500 Hasselt (Belgium)
Tel: 32-11-300868
Fax: 32-11-300890

France
Clare France Sales
Lead Rep
99 route de Versailles
91160 Champlan
France
Tel: 33 1 69 79 93 50
Fax: 33 1 69 79 93 59

Germany
Clare Germany Sales
ActiveComp Electronic GmbH
Mitterstrasse 12
85077 Manching
Germany
Tel: 49 8459 3214 10
Fax: 49 8459 3214 29

Italy
C.L.A.R.E.s.a.s.
Via C. Colombo 10/A
I-20066 Melzo (Milano)
Tel: 39-02-95737160
Fax: 39-02-95738829

Sweden
Clare Sales
Comptronic AB
Box 167
S-16329 Spånga
Tel: 46-862-10370
Fax: 46-862-10371

United Kingdom
Clare UK Sales
Marco Polo House
Cook Way
Bindon Road
Taunton
UK-Somerset TA2 6BG
Tel: 44-1-823 352541
Fax: 44-1-823 352797

ASIA/PACIFIC

Asian Headquarters
Clare
Room N1016, Chia-Hsin, Bldg II,
10F, No. 96, Sec. 2
Chung Shan North Road
Taipei, Taiwan R.O.C.
Tel: 886-2-2523-6368
Fax: 886-2-2523-6369

http://www.clare.com

Clare, Inc. makes no representations or warranties with respect to the accuracy or completeness of the contents of this publication and reserves the right to make changes to specifications and product descriptions at any time without notice. Neither circuit patent licenses nor indemnity are expressed or implied. Except as set forth in Clare's Standard Terms and Conditions of Sale, Clare, Inc. assumes no liability whatsoever, and disclaims any express or implied warranty, relating to its products including, but not limited to, the implied warranty of merchantability, fitness for a particular purpose, or infringement of any intellectual property right.

The products described in this document are not designed, intended, authorized or warranted for use as components in systems intended for surgical implant into the body, or in other applications intended to support or sustain life, or where malfunction of Clare's product may result in direct physical harm, injury, or death to a person or severe property or environmental damage. Clare, Inc. reserves the right to discontinue or make changes to its products at any time without notice.

Specification: AN-113-R1
©Copyright 2001, Clare, Inc.
OptoMOS® is a registered trademark of Clare, Inc.
All rights reserved. Printed in USA.
6/25/01