

### Features

- Meets PC Card (PCMCIA) height requirements
- Zero standby current
- PCB real estate and cost savings
- Can be used with LITELINK II and LITELINK III parts

### Compliance

- TIA/EIA/IS-968 (FCC part 68)
- UL1950
- UL60950
- EN/IEC 60950-1 compliant
- EN55022B
- CISPR22B
- EN55024
- TBR-21

### Ordering Information

| Part Number | Description                                          |
|-------------|------------------------------------------------------|
| CPC5601D    | 16-pin, 14-lead SOIC, 0.300" wide package, 50/Tube   |
| CPC5601DTR  | 16-pin, 14-lead SOIC, 0.300" wide package, 1000/Reel |

### Description

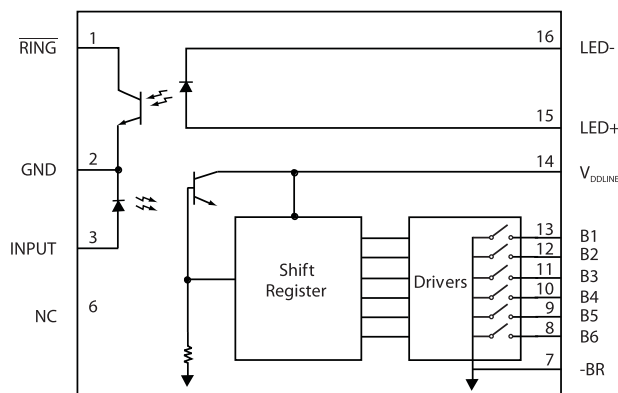
The CPC5601 is a serially-programmed driver IC for use with IXYS Integrated Circuits Division's **LITELINK Silicon Data Access Arrangement (DAA) ICs**. The CPC5601 allows host-equipment control of DAA characteristics for worldwide DAA implementations, avoiding multiple implementations with discrete component changes or "stuff" options. The small, low-profile package makes the CPC5601 ideal for 56K PC Card (PCMCIA) modems, PC motherboards, and soft-modems.

The CPC5601 uses opto-electronics to maintain the isolation barrier required in the data access arrangement for connection of host devices to the public switched telephone network (PSTN).

The one-bit serial input of the CPC5601 recovers clocking information from the input signal to set bits in the shift register. The shift register outputs connect to open-drain FET latches that are used to switch in different external components to set V/I slope, DC termination current limit, gain, and AC termination value in LITELINK DAA implementations. The CPC5601 does not need a clock signal for shift register operation, but relies on internal timing instead.

The CPC5601 also includes an opto-coupler for ring detection applications where the AC coupled ring detector of the LITELINK DAA is not used.

Figure 1. CPC5601 Block Diagram



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## 1. Specifications

### 1.1 Absolute Minimum and Maximum Ratings

| Parameter             | Minimum | Maximum | Unit             | Conditions                                 |
|-----------------------|---------|---------|------------------|--------------------------------------------|
| Isolation Voltage     | 1500    | -       | V <sub>RMS</sub> | From pins 1, 2, and 3 to pins 7 through 16 |
| Operating temperature | 0       | +85     | °C               |                                            |
| Storage temperature   | -40     | +125    | °C               |                                            |
| Soldering temperature | -       | +220    | °C               |                                            |

*Absolute maximum ratings are stress ratings. Stresses in excess of these ratings can cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this data sheet is not implied. Exposure of the device to the absolute maximum ratings for an extended period may degrade the device and affect its reliability.*

### 1.2 Electrical Characteristics

| Parameter                                                                                                                                                                                                                                                                                                                                                  | Minimum | Typical | Maximum | Unit | Conditions                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|------|------------------------------------------------|
| <b>Data Input</b>                                                                                                                                                                                                                                                                                                                                          |         |         |         |      |                                                |
| Input high threshold current                                                                                                                                                                                                                                                                                                                               | -       | 1       | 5       | mA   |                                                |
| Input low threshold current                                                                                                                                                                                                                                                                                                                                | 0.10    | 0.20    | -       | mA   |                                                |
| Input voltage drop                                                                                                                                                                                                                                                                                                                                         | 0.9     | 1.2     | 1.4     | V    | I <sub>F</sub> = 5 mA                          |
| <b>b1 Through b5 Output Driver</b>                                                                                                                                                                                                                                                                                                                         |         |         |         |      |                                                |
| Output Current                                                                                                                                                                                                                                                                                                                                             | -       | -       | 10      | mA   |                                                |
| Output Breakdown Voltage                                                                                                                                                                                                                                                                                                                                   | -       | -       | 6       | V    |                                                |
| On Resistance                                                                                                                                                                                                                                                                                                                                              | -       | 10      | 11      | Ω    | Supply voltage ≥ 2.8 V                         |
| <b>b6 Output Driver</b>                                                                                                                                                                                                                                                                                                                                    |         |         |         |      |                                                |
| Output Current                                                                                                                                                                                                                                                                                                                                             | -       | -       | 120     | mA   |                                                |
| Output Breakdown Voltage                                                                                                                                                                                                                                                                                                                                   | -       | -       | 6       | V    |                                                |
| On Resistance                                                                                                                                                                                                                                                                                                                                              | -       | 0.5     | 1.4     | Ω    | Supply voltage ≥ 2.8 V                         |
| <b>Ring Detect Input</b>                                                                                                                                                                                                                                                                                                                                   |         |         |         |      |                                                |
| Input Control Current                                                                                                                                                                                                                                                                                                                                      | 6       | 20      | 100     | mA   | I <sub>C</sub> = 2 mA, V <sub>CE</sub> = 0.5 V |
| Input Voltage drop                                                                                                                                                                                                                                                                                                                                         | 0.9     | 1.2     | 1.4     | V    | I <sub>F</sub> = 5 mA                          |
| <b>Ring Detect Output</b>                                                                                                                                                                                                                                                                                                                                  |         |         |         |      |                                                |
| Blocking Voltage                                                                                                                                                                                                                                                                                                                                           | 20      | 50      | -       | V    | I <sub>C</sub> = 10 mA                         |
| Dark Current                                                                                                                                                                                                                                                                                                                                               | -       | 50      | 500     | nA   | I <sub>F</sub> = 0 mA                          |
| Saturation Voltage                                                                                                                                                                                                                                                                                                                                         | -       | 0.3     | 0.5     | V    | I <sub>C</sub> = 2 mA, I <sub>F</sub> = 16 mA  |
| Current transfer ratio                                                                                                                                                                                                                                                                                                                                     | 33      | 400     | -       | %    | I <sub>F</sub> = 6 mA, V <sub>CE</sub> = 0.5 V |
| <b>Power Requirements</b>                                                                                                                                                                                                                                                                                                                                  |         |         |         |      |                                                |
| Supply Voltage                                                                                                                                                                                                                                                                                                                                             | 2.5     | 3.5     | 5.5     | V    |                                                |
| Total supply current (input current low)                                                                                                                                                                                                                                                                                                                   | -       | 0.01    | 1       | μA   |                                                |
| Total supply current (input current high)                                                                                                                                                                                                                                                                                                                  | -       | 10      | 20      | μA   |                                                |
| Specifications subject to change without notice. All performance characteristics based on the use of IXYS Integrated Circuits Division application circuits. Functional operation of the device at conditions beyond those specified here is not implied. Specification conditions: V <sub>DD</sub> = 5V, temperature = 25 °C, unless otherwise indicated. |         |         |         |      |                                                |

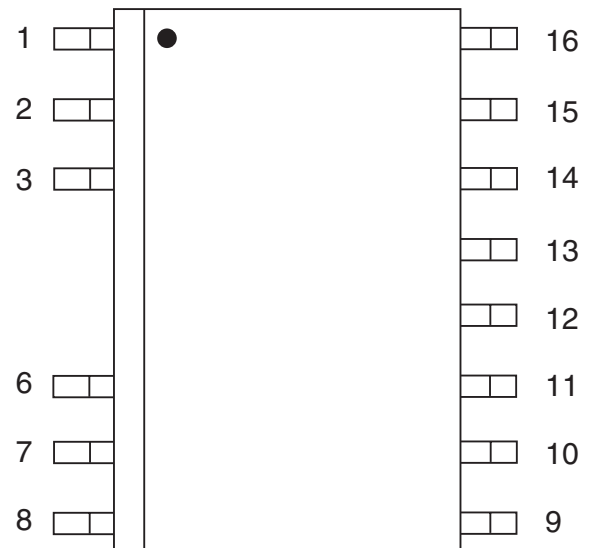
### 1.3 Timing Characteristics

| Parameter                      | Minimum | Typical | Maximum | Unit          | Conditions                                                   |
|--------------------------------|---------|---------|---------|---------------|--------------------------------------------------------------|
| Setup time                     | 50      | -       | -       | $\mu\text{S}$ | logic low before positive timing transition on input (pin 3) |
| Data hold time                 | 60      | -       | -       | $\mu\text{S}$ | hold time after internal 140 $\mu\text{S}$ clock period      |
| Data latch time                | -       | -       | 140     | $\mu\text{S}$ | from positive transition on input                            |
| Input hold time for output on  | 200     | -       | -       | $\mu\text{S}$ |                                                              |
| Input hold time for output off | -       | -       | 50      | $\mu\text{S}$ |                                                              |

### 1.4 Pinout

| Pin | Name               | Function                                                 |
|-----|--------------------|----------------------------------------------------------|
| 1   | RING               | Opto-isolated ring output                                |
| 2   | GND                | Analog host system ground                                |
| 3   | INPUT              | Serial data input used to program outputs b1 through b6. |
| 4   | NC                 | No connection                                            |
| 5   | NC                 | No connection                                            |
| 6   | NC                 | No connection                                            |
| 7   | BR-                | Phone line side common                                   |
| 8   | B6                 | Output b6                                                |
| 9   | B5                 | Output b5                                                |
| 10  | B4                 | Output b4                                                |
| 11  | B3                 | Output b3                                                |
| 12  | B2                 | Output b2                                                |
| 13  | B1                 | Output b1                                                |
| 14  | $V_{\text{DDLIN}}$ | Telephone line side voltage source                       |
| 15  | LED+               | Ring LED anode                                           |
| 16  | LED-               | Ring LED cathode                                         |

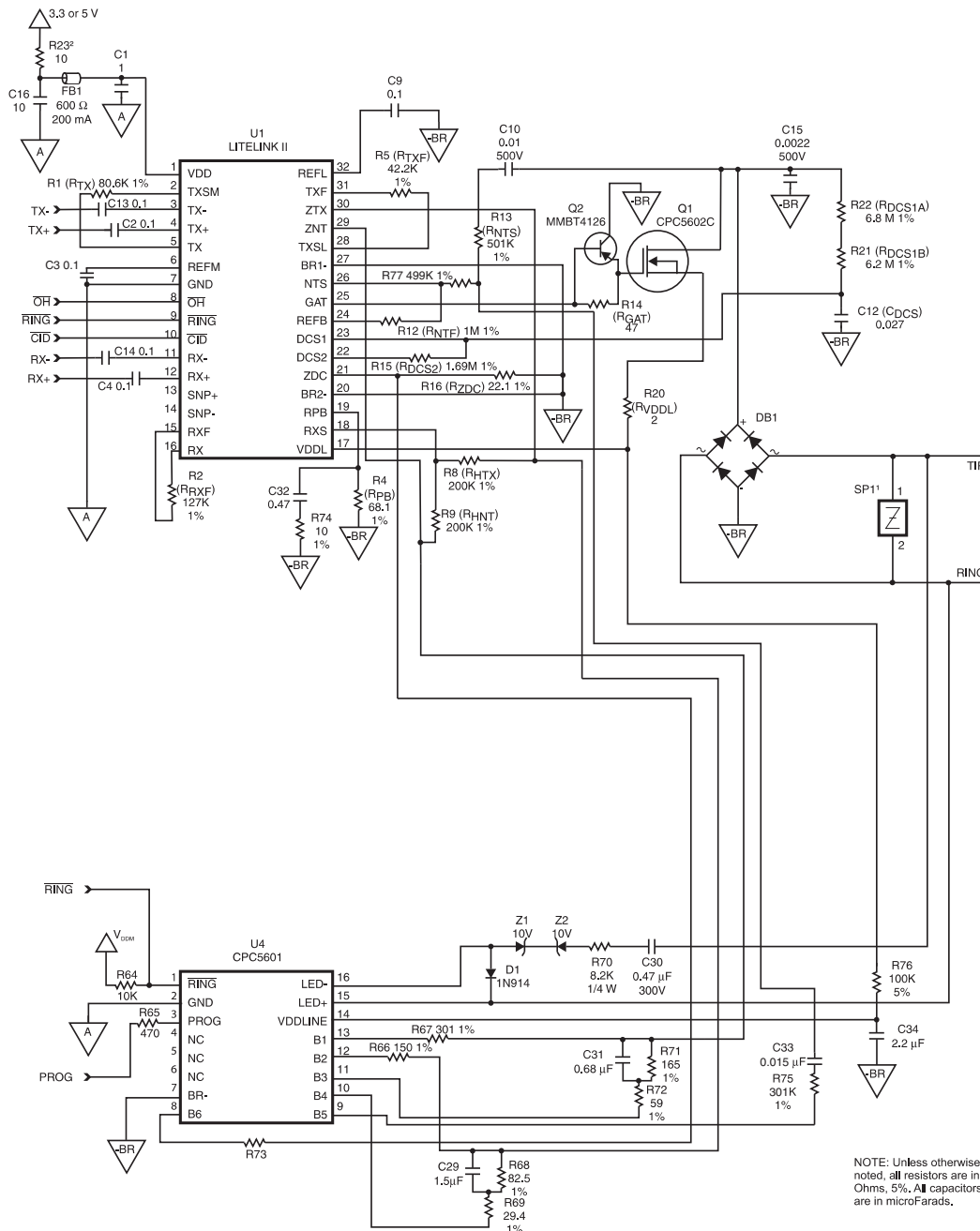
**Figure 2. CPC5601 Pinout**



## 2. Application

In the application circuits shown below, the CPC5601 is used to switch AC termination and gain. Loop-current limit switching is optional.

**Figure 3. CPC5601 Application Circuit Using the LITELINK II and the Optical Snoop Circuit**



<sup>1</sup>This design was tested and found to comply with FCC part 68 with this part. Other compliance requirements may require a different part.

<sup>2</sup>Higher noise power supplies may require substitution of a 220  $\mu$ H inductor, Toko 380HB-2215 or similar. See the power quality section of Clare application note AN-146, [Guidelines for Effective LITELINK Designs](#) for more information. Both application circuits use the same components for setting AC termination and the telephone line current limit.

<sup>3</sup>Addition of this capacitor improves trans-hybrid loss.

<sup>2</sup>Higher noise power supplies may require substitution of a 220  $\mu$ H inductor, Toko 380HB-2215 or similar. See the power quality section of Clare application note AN-146, [Guidelines for Effective LITELINK Designs](#) for more information. Both application circuits use the same components for setting AC termination and the telephone line current limit.

## 2.1 Application Circuit Configurations

Figure 4 shows LITELINK II in circuit designed to use the optical snoop circuit in the CPC5601 for ring detection. Figure 5 shows LITELINK III in a circuit that uses the LITELINK snoop circuit ring detection and display feature (caller ID) signal processing. Note that either generation of LITELINK can be used with either signal monitoring scheme. Using the optical path on the CPC5601 for ring detect precludes on-hook display feature signal processing.

## 2.2 AC Termination

### 2.2.1 LITELINK II

The networks connected to outputs b1, b2, b3 and b4 provide selectable telephone line AC termination depending on which network is switched in place of  $R_{ZNT}$  (see the appropriate [LITELINK](#) data sheet and the application note [Understanding LITELINK](#) for more information).

In North American applications, turn outputs b1 and b2 on, and turn outputs b3 and b4 off to switch in the required  $600\ \Omega$  AC termination. For European applications, turn outputs b1 and b2 off, and outputs b3 and b4 on to switch in the complex AC termination network.

### 2.2.2 LITELINK III

The networks connected to outputs b1 and b3 provide selectable telephone line AC termination depending on which network is switched in place of  $R_{ZNT}$  (see the appropriate [LITELINK](#) data sheet and the application note [Understanding LITELINK](#) for more information). The resistor connected to output b2 provides the required bias current for North American applications.

In North American applications, turn outputs b1 and b2 on, and turn output b3 off to switch in the required  $600\ \Omega$  AC termination. For European applications, turn outputs b1 and b2 off, and output b3 on to switch in the complex AC termination network.

## 2.3 LITELINK III Gain

Turning output 5 on adds attenuation to the receive path, which is required for the complex termination. Asserting the MODE pin on LITELINK III corrects for the added attenuation.

## 2.4 Current Limiting

Clare recommends using the default value for RZDC to set the loop-current limit to 133 mA. You can, if required, adjust the current limit level by adding R73 and using output b6 to switch this value in parallel with RZDC. See the appropriate LITELINK datasheet for more information on setting loop-current limits.

## 2.5 Figure 3. Part List

| Qty. | Reference                | Value                                                 | Suppliers                                   |
|------|--------------------------|-------------------------------------------------------|---------------------------------------------|
| 1    | U1                       | CPC561x LITELINK II                                   | IXYS Integrated Circuits Division           |
| 1    | U4                       | CPC5601 Auxiliary Programmable Driver                 |                                             |
| 1    | Q1                       | CPC5602C N-Channel Depletion-Mode FET                 |                                             |
| 1    | Q2                       | MMBT4126 PNP bipolar transistor                       |                                             |
| 1    | DB1                      | S1ZB60 or DB104 Bridge Rectifier                      | Fairchild                                   |
| 1    | D1                       | 1N914                                                 | Sindengen Co., Diodes, Inc.                 |
| 2    | Z1, Z2                   | 10V Zener Diode                                       |                                             |
| 1    | SP1                      | P3100SB Sidactor                                      | Teccor, TI, ST Microelectronics             |
| 1    | FB1                      | 600 $\Omega$ , 200 mA ferrite bead                    | Murata BLM11A601S or similar                |
| 1    | C1                       | 1 $\mu$ F, 16 V, $\pm$ 10%                            | Panasonic, AVX, Novacap, Murata, SMEC       |
| 6    | C2, C3, C4, C9, C13, C14 | 0.1 $\mu$ F, 16 V, $\pm$ 10%                          |                                             |
| 1    | C10                      | 0.01 $\mu$ F, 500 V, $\pm$ 10% <sup>1</sup>           |                                             |
| 1    | C12                      | 0.027 $\mu$ F, 16 V, $\pm$ 10%                        |                                             |
| 1    | C15                      | 0.0022 $\mu$ F, 500 V, $\pm$ 10% <sup>1</sup>         |                                             |
| 1    | C16                      | 10 $\mu$ F, 16 V, $\pm$ 10%                           |                                             |
| 1    | C29                      | 1.5 $\mu$ F, 16 V, $\pm$ 10%                          |                                             |
| 1    | C30                      | 0.47 $\mu$ F, 300 V, $\pm$ 10%                        |                                             |
| 1    | C31                      | 0.68 $\mu$ F, 16 V, $\pm$ 10%                         |                                             |
| 1    | C32                      | 0.47 $\mu$ F, 16 V, $\pm$ 10%                         |                                             |
| 1    | C33                      | 0.015 $\mu$ F, 16 V, $\pm$ 10%                        |                                             |
| 1    | C34                      | 2.2 $\mu$ F, 16 V, $\pm$ 10%                          |                                             |
| 1    | R1                       | 80.6 K $\Omega$ , 1/16W, $\pm$ 1%                     | Panasonic, Electro Films, FMI, Vishay, etc. |
| 1    | R2                       | 127 K $\Omega$ , 1/16W, $\pm$ 1%                      |                                             |
| 1    | R4                       | 68.1 $\Omega$ , 1/16W, $\pm$ 1%                       |                                             |
| 1    | R5                       | 42.2 K $\Omega$ , 1/16W, $\pm$ 1%                     |                                             |
| 2    | R8, R9                   | 200 K $\Omega$ , 1/16W, $\pm$ 1%                      |                                             |
| 1    | R13                      | 501 K $\Omega$ , 1/16W, $\pm$ 1%                      |                                             |
| 1    | R14                      | 47 $\Omega$ , 1/16W, $\pm$ 1%                         |                                             |
| 1    | R15                      | 1.69 M $\Omega$ , 1/16W, $\pm$ 1%                     |                                             |
| 1    | R20                      | 2 $\Omega$ , 1/16W, $\pm$ 1%                          |                                             |
| 1    | R21                      | 6.2 M $\Omega$ , 1/4W, $\pm$ 1%                       |                                             |
| 1    | R22                      | 6.8 M $\Omega$ , 1/4W, $\pm$ 1%                       |                                             |
| 1    | R23                      | 10 $\Omega$ , 1/16W, $\pm$ 5% or 220 $\mu$ H inductor |                                             |
| 1    | R64                      | 10 k $\Omega$ , 1/16W, $\pm$ 5%                       |                                             |
| 1    | R65                      | 470 $\Omega$ , 1/16W, $\pm$ 5%                        |                                             |
| 1    | R66                      | 150 $\Omega$ , 1/16W, $\pm$ 1%                        |                                             |
| 1    | R67                      | 301 $\Omega$ , 1/16W, $\pm$ 1%                        |                                             |
| 1    | R68                      | 82.5 $\Omega$ , 1/16W, $\pm$ 1%                       |                                             |
| 1    | R69                      | 29.4 $\Omega$ , 1/16W, $\pm$ 1%                       |                                             |
| 1    | R70                      | 8.2 k $\Omega$ , 1/4W, $\pm$ 5%                       |                                             |
| 1    | R71                      | 165 $\Omega$ , 1/16W, $\pm$ 1%                        |                                             |
| 1    | R72                      | 59 $\Omega$ , 1/16W, $\pm$ 1%                         |                                             |
| 1    | R73                      | optional, see text                                    |                                             |
| 1    | R74                      | 10 $\Omega$ , 1/16W, $\pm$ 1%                         |                                             |
| 1    | R75                      | 402 k $\Omega$ , 1/16W, $\pm$ 1%                      |                                             |
| 1    | R76                      | 100 k $\Omega$ , 1/16W, $\pm$ 5%                      |                                             |
| 1    | R77                      | 499 k $\Omega$ , 1/16W, $\pm$ 1%                      |                                             |



**2.6 Figure 4. Part List**

| Qty. | Reference        | Value                                                  | Suppliers                             |
|------|------------------|--------------------------------------------------------|---------------------------------------|
| 1    | U1               | CPC562x LITELINK III                                   | IXYS Integrated Circuits Division     |
| 1    | U4               | CPC5601 Auxiliary Programmable Driver                  |                                       |
| 1    | Q1               | CPC5602C N-Channel Depletion-Mode FET                  |                                       |
| 1    | DB1              | S1ZB60 or DB104 Bridge Rectifier                       |                                       |
| 1    | SP1              | P3100SB Sidactor                                       | Sindengen Co., Diodes, Inc.           |
| 1    | FB1              | 600 $\Omega$ , 200 mA ferrite bead                     | Teccor, TI, ST Microelectronics       |
| 1    | C1               | 1 $\mu$ F, 16 V, $\pm 10\%$                            | Murata BLM11A601S or similar          |
| 4    | C2, C9, C13, C14 | 0.1 $\mu$ F, 16 V, $\pm 10\%$                          |                                       |
| 2    | C7, C8           | 220 pF, 2 kV, $\pm 5\%$ <sup>1</sup>                   |                                       |
| 2    | C10, C15         | 0.01 $\mu$ F, 500 V, $\pm 10\%$ <sup>1</sup>           |                                       |
| 1    | C12              | 0.027 $\mu$ F, 16 V, $\pm 10\%$                        |                                       |
| 1    | C15              | 0.0022 $\mu$ F, 500 V, $\pm 10\%$ <sup>1</sup>         |                                       |
| 1    | C16              | 10 $\mu$ F, 16 V, $\pm 10\%$                           |                                       |
| 1    | C18              | 15 pF, 50 V, $\pm 10\%$                                |                                       |
| 1    | C21              | 100 pF, 50 V, $\pm 10\%$                               |                                       |
| 1    | C29              | 1.5 $\mu$ F, 16 V, $\pm 10\%$                          |                                       |
| 1    | C30              | 0.47 $\mu$ F, 300 V, $\pm 10\%$                        |                                       |
| 1    | C31              | 0.68 $\mu$ F, 16 V, $\pm 10\%$                         |                                       |
| 1    | C32              | 0.47 $\mu$ F, 16 V, $\pm 10\%$                         |                                       |
| 1    | C33              | 0.024 $\mu$ F, 16 V, $\pm 10\%$                        |                                       |
| 1    | C34              | 2.2 $\mu$ F, 16 V, $\pm 10\%$                          |                                       |
| 1    | R1               | 80.6 K $\Omega$ , 1/16W, $\pm 1\%$                     | Panasonic, AVX, Novacap, Murata, SMEC |
| 1    | R2               | 130 K $\Omega$ , 1/16W, $\pm 1\%$                      |                                       |
| 1    | R3               | 1.5 M $\Omega$ , 1/16W, $\pm 1\%$                      |                                       |
| 1    | R4               | 68.1 $\Omega$ , 1/16W, $\pm 1\%$                       |                                       |
| 1    | R5               | 60.4 K $\Omega$ , 1/16W, $\pm 1\%$                     |                                       |
| 4    | R6, R7, R44, R45 | 1.8 M $\Omega$ , 1/10W, $\pm 1\%$                      |                                       |
| 1    | R8               | 221 K $\Omega$ , 1/16W, $\pm 1\%$                      |                                       |
| 2    | R10, R12         | 499 K $\Omega$ , 1/16W, $\pm 1\%$                      |                                       |
| 1    | R13              | 501 K $\Omega$ , 1/16W, $\pm 1\%$                      |                                       |
| 1    | R14              | 47 $\Omega$ , 1/16W, $\pm 1\%$                         |                                       |
| 1    | R15              | 1.69 M $\Omega$ , 1/16W, $\pm 1\%$                     |                                       |
| 1    | R16              | 8.2 $\Omega$ , 1/16W, $\pm 1\%$                        |                                       |
| 1    | R18              | 10 K $\Omega$ , 1/16W, $\pm 1\%$                       |                                       |
| 1    | R20              | 2 $\Omega$ , 1/16W, $\pm 1\%$                          |                                       |
| 1    | R21              | 6.2 M $\Omega$ , 1/4W, $\pm 1\%$                       |                                       |
| 1    | R22              | 6.8 M $\Omega$ , 1/4W, $\pm 1\%$                       |                                       |
| 1    | R23              | 10 $\Omega$ , 1/16W, $\pm 5\%$ or 220 $\mu$ H inductor |                                       |
| 1    | R64              | 10 k $\Omega$ , 1/16W, $\pm 5\%$                       |                                       |
| 1    | R65              | 470 $\Omega$ , 1/16W, $\pm 5\%$                        |                                       |
| 1    | R66              | 150 $\Omega$ , 1/16W, $\pm 1\%$                        |                                       |
| 1    | R67              | 301 $\Omega$ , 1/16W, $\pm 1\%$                        |                                       |
| 1    | R71              | 165 $\Omega$ , 1/16W, $\pm 1\%$                        |                                       |
| 1    | R72              | 59 $\Omega$ , 1/16W, $\pm 1\%$                         |                                       |
| 1    | R73              | optional, see text                                     |                                       |
| 1    | R75              | 402 k $\Omega$ , 1/16W, $\pm 1\%$                      |                                       |
| 1    | R76              | 100 k $\Omega$ , 1/16W, $\pm 5\%$                      |                                       |
| 1    | R77              | 499 k $\Omega$ , 1/16W, $\pm 1\%$                      |                                       |
| 1    | R78              | 200 k $\Omega$ , 1/16W, $\pm 1\%$                      |                                       |

### 2.7 Operational Sequence

In the application circuits above, the CPC5601 is powered from the telephone line only when the LITELINK is off-hook. This requires that you set the telephone line characteristics controlled by the CPC5601 under host system control immediately after taking the DAA off-hook or after pulse dialing is complete, using the following sequence:

1. For incoming calls, validate a ring signal by having the host system poll or read the output of  $\overline{\text{RING}}$  (ring detect via snoop circuit on the LITELINK) or  $\overline{\text{RING}}$  (ring detect via opto-isolated ring circuit in the CPC5601).
2. Assert  $\overline{\text{OH}}$  to complete the connection.
3. Set the telephone line characteristics of the DAA using the CPC5601 via the programming method (see "Programming" on page 10).

With this circuit, you must program the CPC5601 as soon as possible after asserting off hook. Leaving the CPC5601 unprogrammed leaves open the possibility of LITELINK instability due to lack of AC termination.

### 2.8 Output Current Ratings

Output b6 is the only output that can be used for the current limiting function of a DAA. The FET on output b6 can sink up to 120 mA of current, while the other outputs can sink up to 10 mA.

The other outputs can be used for any of the other switchable functions on the telephone line side of a DAA, as long as the current does not exceed the 10 mA limit.

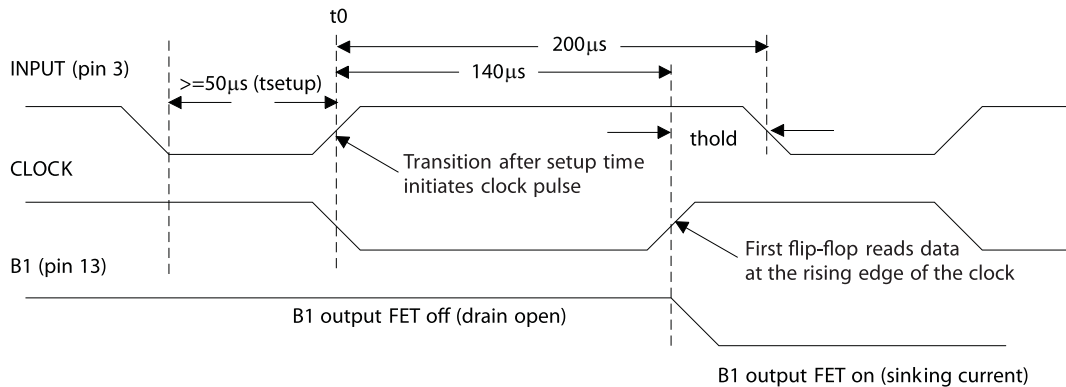
## 3. Programming

### 3.1 Latch Circuit Description

Data applied to the input pin is optically coupled to the shift register through a pulse generator. Each low-to-high transition in the pulse generator triggers a clock pulse. Clock pulses are applied to the CLK input of six rising-edge-triggered flip-flops. The non-inverted input data is fed to the flip-flops at all times, but the flip-flops are only clocked on receipt of a pulse from the pulse generator. The flip-flops drive six FET switches.

### 3.2 Programming Protocol

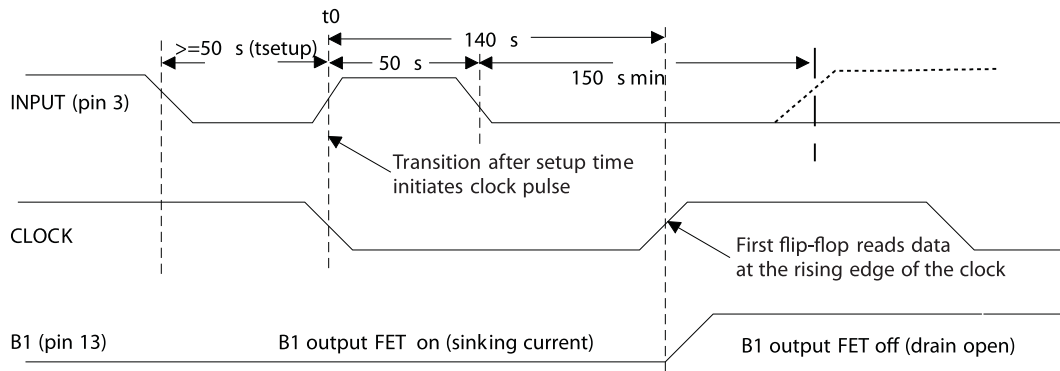
**Figure 5. Latch Circuit Timing to Turn an Output On**



A setup pulse on the input of at least 50  $\mu\text{S}$  starts the bit programming sequence. The trailing edge of the setup pulse starts a timer on the CPC5601 ( $t_0$ ). After 140  $\mu\text{S}$ , the value of the input is latched into the shift register.

To set an output, hold the input high for 200  $\mu\text{S}$  from the leading edge after the setup pulse. This turns on the corresponding open-drain FET to sink current.

**Figure 6. Latch Circuit Timing to Turn an Output Off**



To clear an output, hold the input high for 50  $\mu\text{S}$  after the setup pulse, then take the input low for at least 150  $\mu\text{S}$ .

Repeat the sequence of the setup pulse followed by the appropriate input condition for each successive bit.

Bear the following in mind while programming the CPC5601:

- All bits must be set in each programming sequence, even to change just one of the outputs.
- Data is placed in least-significant bit (output 1) first.
- After setting all the bits, take the input low. In the

absence of low-to-high transitions on the input, the internal CPC5601 clock is held high, preventing any output changes.

- The CPC5601 does not employ a shift register load function. As new data is shifted into the flip-flops, the outputs (starting with b1) change throughout the data input sequence.

### 3.3 Programming Example

This programming example sets the following CPC5601 output state, suitable for a European DAA:

### 3.3.1 LITELINK III

| b1 (LSB) | b2  | b3 | b4  | b5 | b6 (MSB) |
|----------|-----|----|-----|----|----------|
| off      | off | on | off | on | off      |

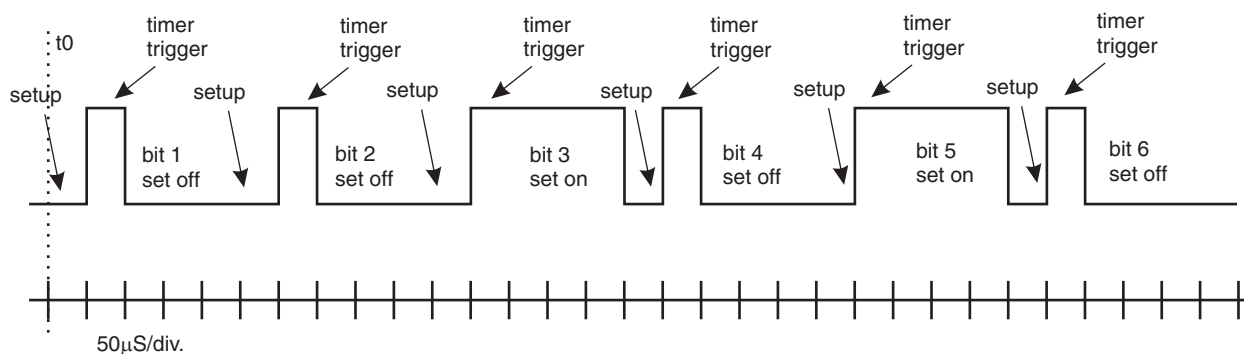
### 3.3.2 LITELINK II

| b1 (LSB) | b2  | b3 | b4 | b5 | b6 (MSB) |
|----------|-----|----|----|----|----------|
| off      | off | on | on | on | off      |

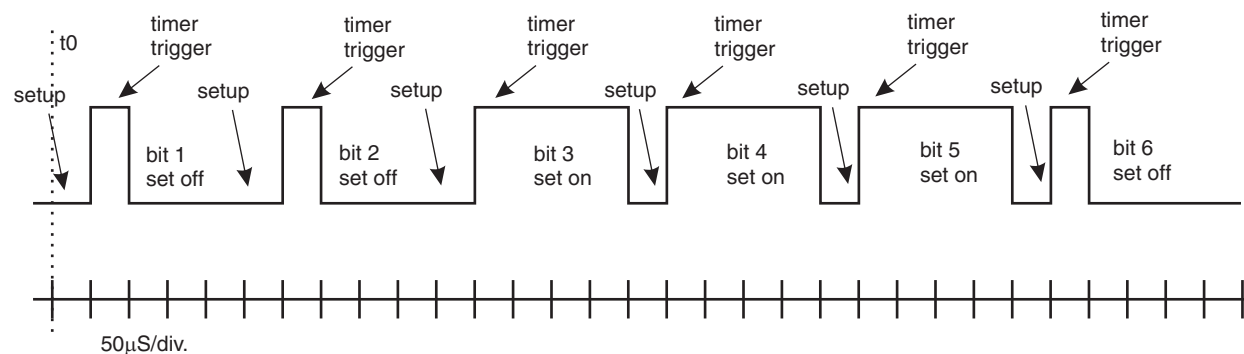
1. Hold the input low for 50  $\mu$ S.

- Set the input high for 50  $\mu$ S to trigger the timer.
- Set the input low for 150  $\mu$ S to set output b1 to off.
- Repeat the steps as shown in the programming waveform below to program all six outputs to the desired pattern.

**Figure 7. LITELINK III European Programming Sample Input Waveform**



**Figure 8. LITELINK II European Programming Sample Input Waveform**



## 4. Regulatory Information

CPC5601 can be used to build products that comply with the requirements of TIA/EIA/IS-968 (formerly FCC part 68), FCC part 15B, TBR-21, EN60950, UL1950, EN55022B, IEC950/IEC60950, CISPR22B, EN55024, and many other standards. CPC5601 complies with the requirements of UL1577. CPC5601 provides supplementary isolation. Metallic surge requirements are met through the inclusion of a Sidactor in the application circuit. Longitudinal surge protection is provided by CPC5601's optical-across-the-barrier technology and the use of high-voltage components in the application circuit as needed.

The information provided in this document is intended to inform the equipment designer but it is not sufficient to assure proper system design or regulatory compliance. Since it is the equipment manufacturer's responsibility to have their equipment properly designed to conform to all relevant regulations, designers using CPC5601 are advised to carefully verify that their end-product design complies with all applicable safety, EMC, and other relevant standards and regulations. Semiconductor components are not rated to withstand electrical overstress or electro-static discharges resulting from inadequate protection measures at the board or system level.

## 5. LITELINK Design Resources

### 5.1 Clare Design Resources

The IXYS Integrated Circuits Division web site has a wealth of information useful for designing with LITE-LINK, including application notes and reference designs that already meet all applicable regulatory requirements. LITELINK data sheets also contains additional application and design information. See the following links:

#### LITELINK datasheets and reference designs

Application note AN-107 **LOCxx Series - Isolated Amplifier Design Principles**

Application note AN-114 **ITC117P**

Application note AN-117 **Customize Caller-ID Gain and Ring Detect Voltage Threshold for CPC5610/11**

Application note AN-140, **Understanding LITELINK**

Application note AN-141, **Enhanced Pulse Dialing with LITELINK**

Application note AN-143, **Loop Reversal Detection with LITELINK**

Application note AN-146, **Guidelines for Effective LITE-LINK Designs**

Application note AN-147, **Worldwide Application of LITE-LINK**

Application note AN-149, **Increased LITELINK II Transmit Power**

Application note AN-150, **Ground-start Supervision Circuit Using IAA110**

### 5.2 Third Party Design Resources

The following also contain information useful for LITE-LINK designs. All of the books are available on [amazon.com](http://amazon.com).

*Understanding Telephone Electronics*, Stephen J. Bigelow, et. al., Butterworth-Heinenman; ISBN: 0750671750.

*Newton's Telecom Dictionary*, Harry Newton, CMP Books; ISBN: 1578200695.

*Photodiode Amplifiers: Op Amp Solutions*, Jerald Graeme, McGraw-Hill Professional Publishing; ISBN: 007024247X

**Teccor, Inc.** Surge Protection Products

*United States Code of Federal Regulations*, CFR 47 Part 68.3.

## 6. Manufacturing Information

### 6.1 Moisture Sensitivity



All plastic encapsulated semiconductor packages are susceptible to moisture ingress. IXYS Integrated Circuits Division classified all of its plastic encapsulated devices for moisture sensitivity according to the latest version of the joint industry standard, **IPC/JEDEC J-STD-020**, in force at the time of product evaluation. We test all of our products to the maximum conditions set forth in the standard, and guarantee proper operation of our devices when handled according to the limitations and information in that standard as well as to any limitations set forth in the information or standards referenced below.

Failure to adhere to the warnings or limitations as established by the listed specifications could result in reduced product performance, reduction of operable life, and/or reduction of overall reliability.

This product carries a **Moisture Sensitivity Level (MSL) rating** as shown below, and should be handled according to the requirements of the latest version of the joint industry standard **IPC/JEDEC J-STD-033**.

| Device   | Moisture Sensitivity Level (MSL) Rating |
|----------|-----------------------------------------|
| CPC5601D | MSL 3                                   |

### 6.2 ESD Sensitivity



This product is **ESD Sensitive**, and should be handled according to the industry standard **JESD-625**.

### 6.3 Reflow Profile

This product has a maximum body temperature and time rating as shown below. All other guidelines of **J-STD-020** must be observed.

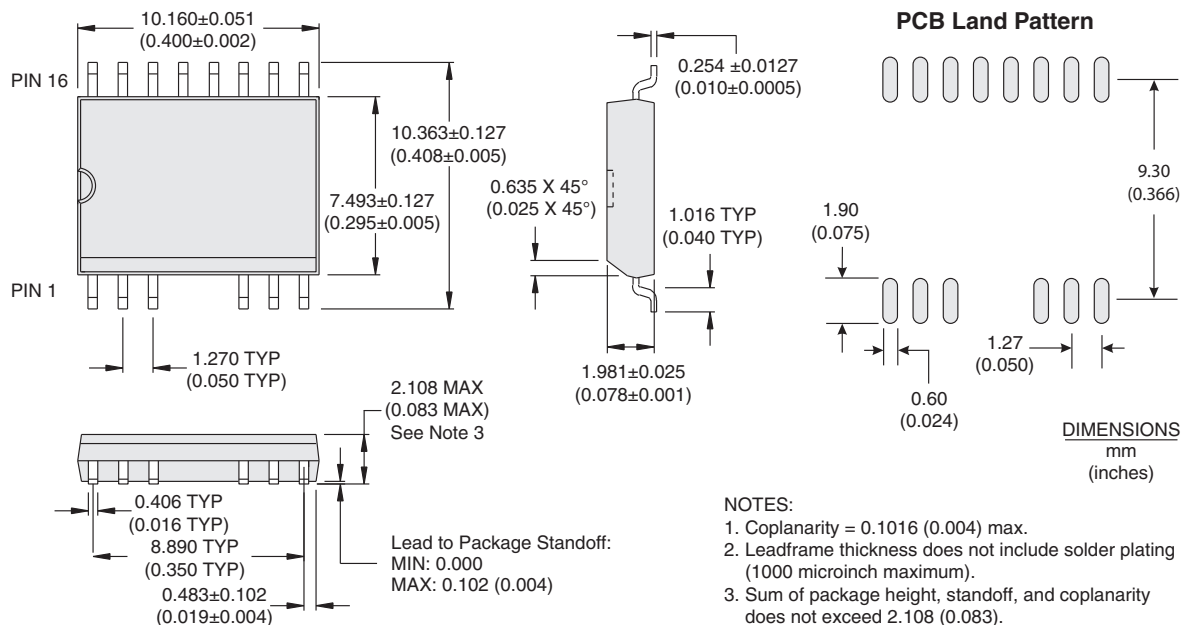
| Device   | Maximum Temperature x Time |
|----------|----------------------------|
| CPC5601D | 260°C for 30 seconds       |

### 6.4 Board Wash

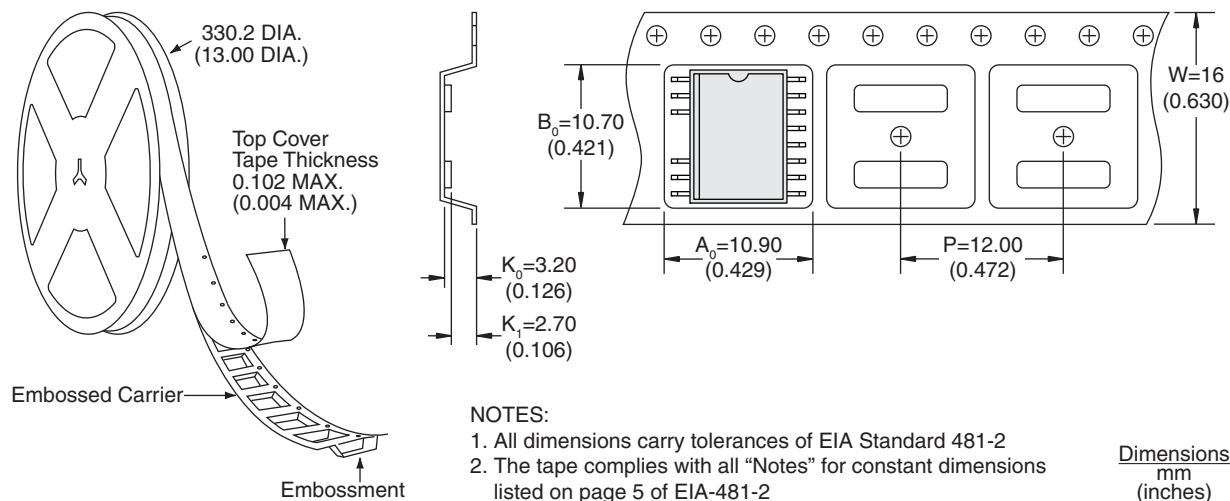
IXYS Integrated Circuits Division recommends the use of no-clean flux formulations. However, board washing to remove flux residue is acceptable, and the use of a short drying bake may be necessary. Chlorine-based or Fluorine-based solvents or fluxes should not be used. Cleaning methods that employ ultrasonic energy should not be used.



## 6.5 CPC5601D Package



## 6.6 CPC5601DTR Tape and Reel Specifications



For additional information please visit our website at: [www.ixysic.com](http://www.ixysic.com)

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