

## Features

- Low Distortion Transformer Signal Coupling (0.01% max)
- Complete Ring Detector Circuit
- Low Power Hook Switch
- Electronic Inductor/Gyrator Circuit
- Surge Protection
- Transient Protection Zener Diodes
- Half- (20X0) or Full- (20X1) Wave Detection
- V.32 bis /V.34 Compatible
- FCC Compatible
- Compatible with U.S. and Canadian Dial-Up Phone Lines
- Supports Leased-Line Operation
- PC board mountable

## Applications

- Modems
- Fax Machines
- Remote Data Acquisition
- Security Systems
- Voice Mail Systems
- PC Motherboard
- Computer Telephony
- Process Control
- Medical
- PBX
- Direct Broadcast Satellite

## Description

The CYG2000, CYG2011, and CYG2020 are Data Access Arrangement (DAA) modules featuring a 350V, 120mA, 15Ω relay used for hook switch; an optocoupler with minimum CTR of 33% for ring detection; and a low-distortion transformer with 28.8kbps capabilities.

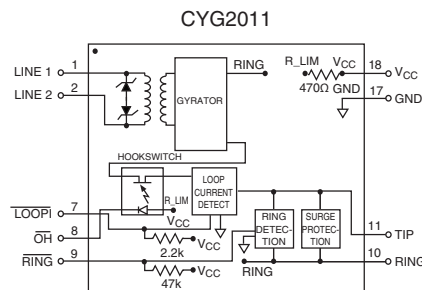
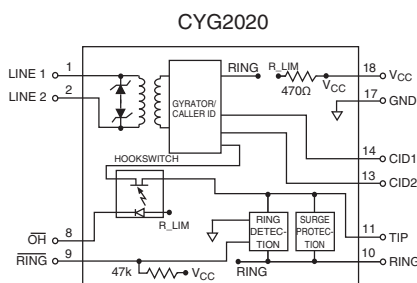
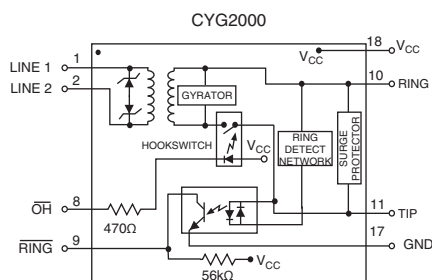
## Approvals

UL Recognized: File E174201

## Ordering Information

Part	Description
CYG2000	DAA Module, Half Wave Ring Detection
CYG2011	DAA Module, Full Wave Ring Detection, Loop Current Detection
CYG2020	DAA Module, Half Wave Ring Detection, CID

## Block Diagrams



## 1 Specifications

### 1.1 Absolute Maximum Ratings @ 25°C

Symbol	Ratings	Units
Isolation Voltage	1000	V <sub>rms</sub>
Tip/Ring (5, 6) Load Current (Continuous)	120	mA
Hook Switch LED Drive Current	50	mA
Hook Switch LED Reverse Voltage	5	V
Ring Detect Phototransistor Voltage (V <sub>CC</sub> )	20	V
Relative Humidity (non-condensing)	10-85	%
Operational Temperature	0-70	°C
Storage Temperature	0-70	°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 conditions beyond those indicated in the operational sections of this data sheet is not implied.*

### 1.2 DC Electrical Characteristics @ 25°C (Unless Otherwise Noted)

Parameter	Conditions	Minimum	Typical	Maximum	Units
On-Hook Impedance	@ 100VDC Across Pins 10 & 11 (R, T) per FCC 68.312	10	-	-	MΩ
Off-Hook Line Leakage Current	@ 100VDC Across Pins 10 & 11 (R, T) per FCC 68.312	-	-	10	μA
Hook Switch Resistance	-	-	-	15	Ω
Off-Hook Supply Current	@ V <sub>CC</sub> = +5V	7	8	9	mA
Hook Switch Power Source, Pin 8	-	4.75	5	20	V
DC Loop Current	-	20	-	120	mA

### 1.3 AC Signal Path Electrical Characteristics @ 25°C (Unless Otherwise Noted)

Parameter	Conditions	Minimum	Typical	Maximum	Units
Return Loss	300Hz - 3500Hz	18	25	-	dB
Insertion Loss					
Transmit	300Hz - 3500Hz, Test Circuit 1	-	-	7	dB
Receive	300Hz - 3500Hz, Test Circuit 2	-	-	7	
Frequency Response	300Hz - 3500Hz	-0.25	-	+0.25	dB
Longitudinal Balance					
On-Hook	Per FCC 68.310	60	-	-	dB
Off-Hook		40	-	-	
DC Loop Current	-	20	-	120	mA
Total Harmonic Distortion	@600Hz and -10dBm	-	-	0.01	%
Secondary Load Impedance	Line 1 and Line 2	-	294	-	Ω
Primary Source Impedance	Tip and Ring	-	600	-	Ω

### 1.4 Ring Detection Circuit Electrical Characteristics @ 25°C (Unless Otherwise Noted)

Parameter	Conditions	Minimum	Typical	Maximum	Units
Ringing Voltage Detection Range	-	20	-	150	V <sub>rms</sub>
Ringing Frequency Detection Range	-	15	-	70	Hz
Ringer Equivalence Number	-	-	0.8B	-	-
Ring (Pin 9) Output Voltage (Pulsed)	@ V <sub>CC</sub> = +5V				
Logic "0", Ring Present		-	-	0.8	V
Logic "1", Ring Not Present		-	-	V <sub>CC</sub>	

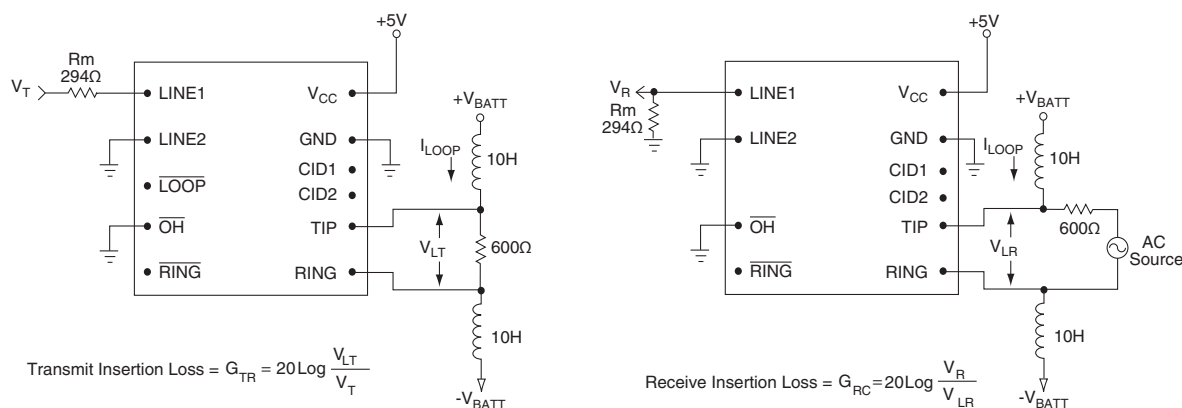
### 1.5 Surge, Transient, and Isolation Electrical Characteristics @ 25°C (Unless Otherwise Noted)

Parameter	Conditions	Minimum	Typical	Maximum	Units
Surge Protection Voltage Tip & Ring (Pins 11, 10)	-	-	-	300	V
Transient Voltage Protection on Line 1 and Line 2 (Pins 1, 2)	-	-5	-	+5	V
Isolation Voltage, Pins (1, 2, 7, 8, 9, 17, 18) to (10, 11, 13, 14)	Per FCC 68.302	-	-	1000	V <sub>rms</sub>

### 1.6 Loop Detection (CYG2011) Electrical Characteristics @ 25°C (Unless Otherwise Noted)

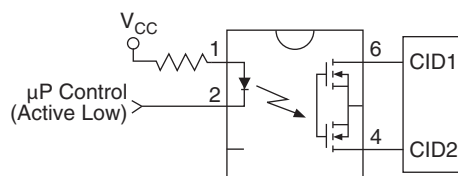
Parameter	Conditions	Minimum	Typical	Maximum	Units
Loop Current Detection Threshold	Internal Optocoupler with 2.2k Pull-Up Resistor	-	-	1000	V <sub>rms</sub>

### 1.7 Test Circuits

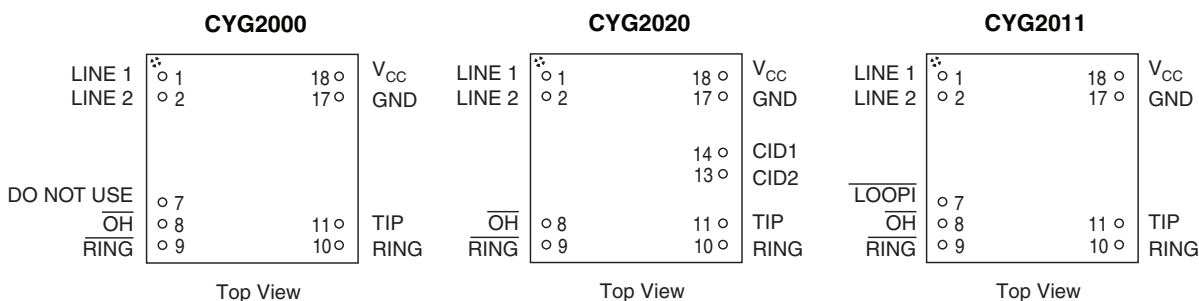


### 1.8 Caller ID Connections (CYG2020)

Pins 13 & 14 should be connected to a 1-Form-A solid state relay (IXYS IC Division LCA110) as shown here:



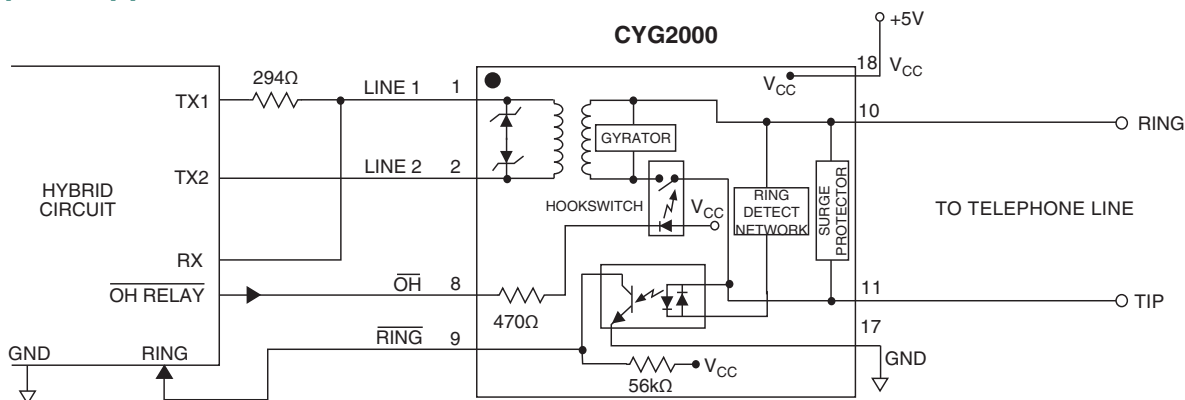
## 2 Package Pinouts



### 2.1 CYG20xx Pinouts and Definitions

Pin	I/O	Name	Function
1	I/O	Line 1	Transformer isolated audio signal coupling path for the telephone line.
2	I/O	Line 2	Transformer isolated audio signal coupling path for the telephone line.
7	I	$\overline{\text{LOOPI}}$	When system is off-hook (OH driven LOW) LOOPI is driven LOW continuously on CYG2011.
		N/C	Keying Pin for CYG2000, do not use.
8	I	$\overline{\text{OH}}$	Driving this pin LOW asserts the off-hook condition. The hook switch LED is current limited by an internal 470 $\Omega$ resistor.
9	O	$\overline{\text{RING}}$	Active LOW indicates an incoming ring signal. This is pulsed LOW by the AC ring signal at the ring frequency from 15-40Hz.
10	I/O	RING	Connection to telephone line Ring conductor.
11	I/O	TIP	Connection to telephone line Tip conductor.
13	O	CID2	Caller ID connection on CYG2020. CID1/CID2 connect to an external 1-Form-A solid state relay (IXYS IC Division LCA110). When the SSR is closed (connecting CID1 to CID2) Caller ID information is presented to LINE1/LINE2 after the first telephone ring burst.
14	O	CID1	Caller ID connection. See CID2 above.
17	I	GND	Connected to host system ground.
18	I	V <sub>CC</sub>	Provides power to the hook switch LED. Typically +5V for appx. 8mA LED current. LED is current limited by an internal 470 $\Omega$ resistor. V <sub>CC</sub> should not exceed 20V.

## 3 Typical Application



## 4 Manufacturing Information

### 4.1 Handling and Assembly Recommendations

The CYG20xx products are not hermetically sealed, and should not be exposed to any liquid-based rinsing processes. IXYS Integrated Circuits Division recommends two (2) approaches: (1) the modem should be installed in a wave-soldering process that uses a no-clean soldering flux that will mostly evaporate during the normal wave-soldering processes, (2) the modem should be soldered in by hand after the rest of the card is wave-soldered.

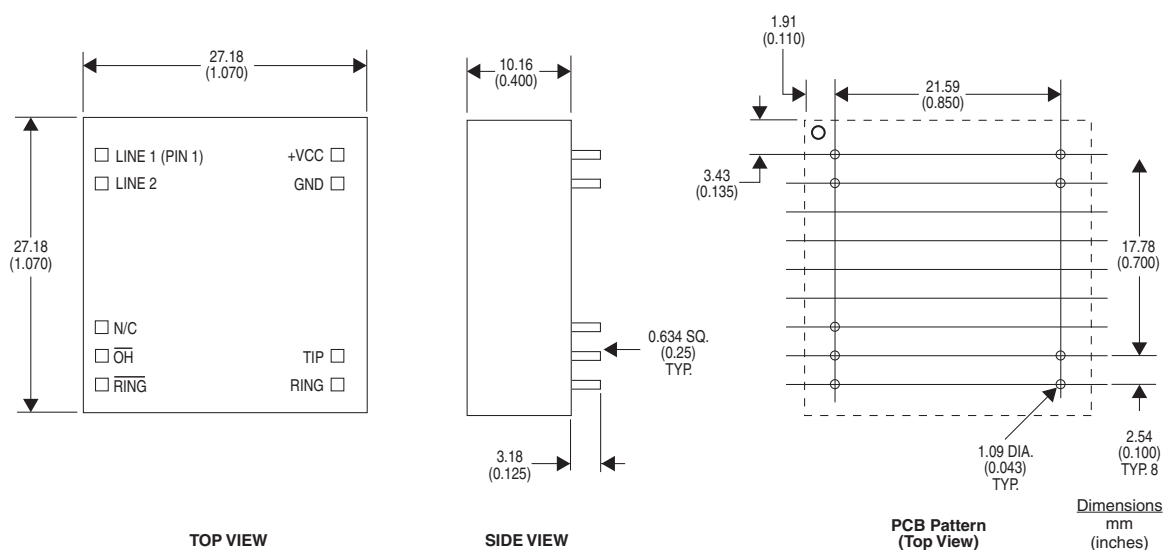
### 4.2 Reflow Profile

These products have a maximum solder temperature as shown below.

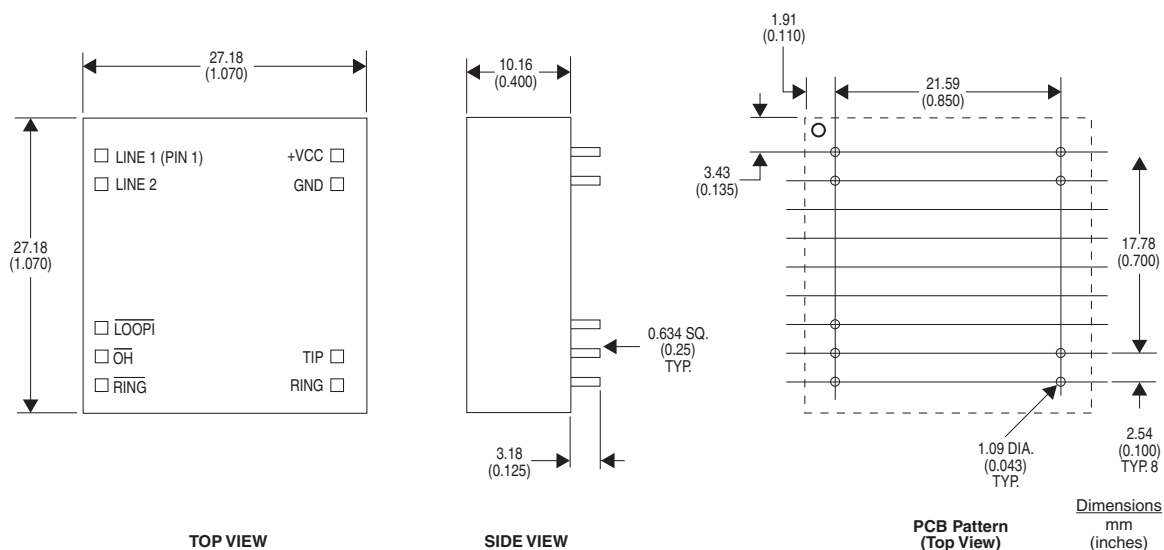
Device	Maximum Temperature
CYG2000 / CYG2011 / CYG2020	260°C

### 4.3 Mechanical Dimensions

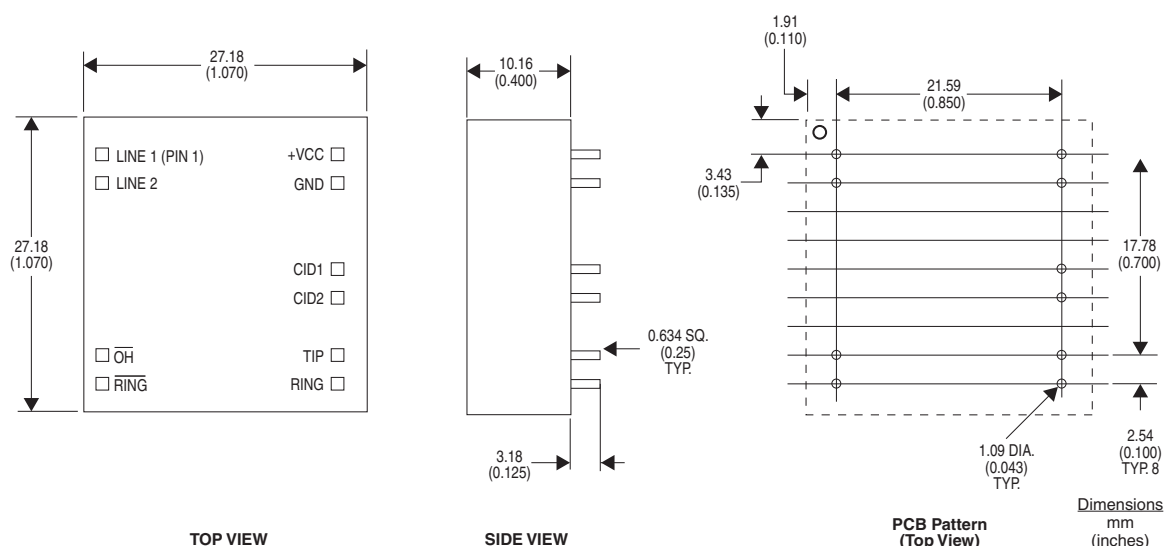
#### 4.3.1 CYG2000



### 4.3.2 CYG2011



### 4.3.3 CYG2020



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

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