ECHELON®

Router 5000

Model
14315R-100

The Router 5000 chip is used to build high performance half-routers that increase the scalability and surviveability of LONWORKS® control networks and lower installation costs by allowing mixed physcial media to be used in a single installation.

Based on the Neuron® 5000 core, the Router 5000 provides the design flexibility to interface to the external transceiver of your choice for building a LONWORKS communication channel.

FEATURES

- 3.3V operation.
- Higher Performance
  - Clock rate up to 40 MHz
  - Larger buffer size to allow for extended NVs and improved throughput.
- Transceiver-independent design.
- Compact 7mm x 7mm 48-pin QFN package.
- Can be connected to a transceiver running at any LONWORKS® bit rate from 610 bps to 1.25Mbps.
- Logical Isolation between two half-routers improves system reliability by isolating failures between channels.
- Transparent multi-channel and multi-media support.
- -40°C to +85°C operating temperature range.

The Router 5000 includes the Router firmware required to implement a half-router. Its compact form factor minimizes the space required to develop a half-router. Customers can develop two half-routers to build a full router with the same or different external transceiver types. Commonly used transceiver types include support for TP/FT-10, TP-RS485, TP/XF-78F, TP/XF-1250 channel types and the LPT-11 transceiver. These external transceivers can run at interface bit rates from 9.8 kbps to 1.25 Mbps.

The Router parameters can be stored in an external EEPROM with a maximum size of 2 KB. Customers will need to specify router parameters that are applicable for the external transceiver type used with the Router 5000. For a full router design, customers can use the same crystal and the same power supply to implement the clock and power supply needed for the two half-routers, which helps minimize the overall size needed to implement a full router.

A Router 5000 can use one of four routing algorithms: **Configured router, Learning router, Bridge or Repeater.** The ability to choose these options allows the customer to trade off system performance for ease of installation. Configured and Learning routers fall into a class of routers known as intelligent routers, which use routing tables to selectively forward messages based on the destination address. A Bridge forwards all valid packets that match its domains, whereas a Repeater forwards all valid packets. Configured routers are easily installed using an installation tool that calculates network topology and layer 4 timing parameters, such as the LonMaker® Integration Tool or an installation tool based on the LNS® network operating system.

Usage

A half-router consists of the Router 5000 chip and an external transceiver along with a crystal to generate the clock and an external memory to hold the router table. Any type of external transceiver can be used with the Router 5000, such as a TP/FT-10, TP-RS485, TP/XF-78, TP/XF-1250 or LPT-11 transceiver. The Router 5000 is compatible with all LONWORKS transceivers, including standard transceivers for free topology, link power, twisted pair, and power line. Using multiple communications media can minimize installation costs and increase system performance by allowing easily installed media, such as power line or link power, to be combined with media such as TP/XF-1250 twisted pair. The two half-routers of a full router are logically isolated so that a failure in one half-router will not affect the other.

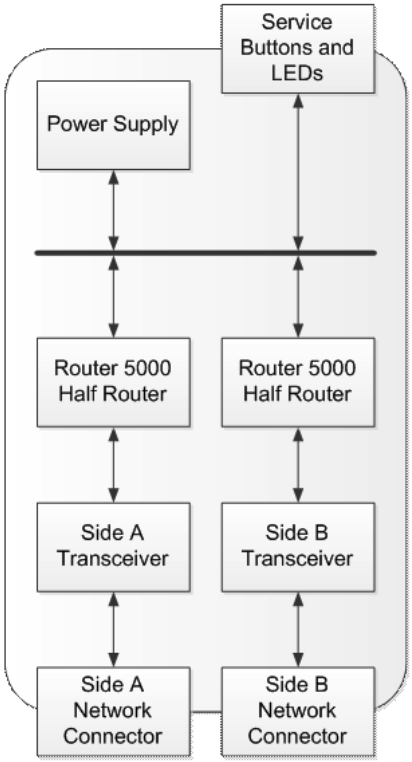


Figure 1: Block Diagram of a LONWORKS Router Based on the Router 5000

LONWORKS application programs do not have to be modified to work with routers. Only the network configuration of a device has to be modified when a device is moved to the far side of a router. The required modifications to the network configuration can be done automatically by an installation tool.

Routers are also independent of the network variables and message tags in a system, and can forward an unlimited number of them, which saves development cost because no code development is required to use routers in a system. It also saves installation and maintenance costs because router configuration is automatically managed by network server tools based on LNS Server. Monitoring and Control Applications, such as those based on the LCA Object Server OCX, do not require modifications to work with multi-channel networks when routers are used. All network configuration is performed over the installed network, further minimizing installation and maintenance costs because routers do not have to be physically accessed to change their configuration.

Router 5000 Pin Configuration

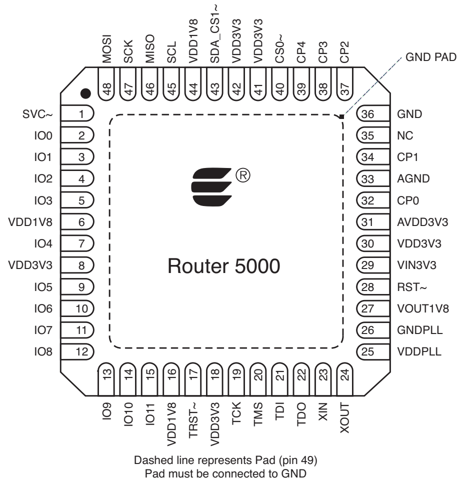


Figure 2: Router 5000 Pinout

Router 5000 Chip Pin Assignments

Pin Name	Pin Number	Type	Description
SVC~	1	Digital I/O	Service (active low)
IO0	2	Digital I/O	IO0 (side A to side B)
IO1	3	Digital I/O	IO1 (side A to side B)
IO2	4	Digital I/O	IO2 (side A to side B)
IO3	5	Digital I/O	IO3 (side A to side B)
VDD1V8	6	Power	1.8 V Power Input (from internal voltage regulator)
IO4	7	Digital I/O	IO4 (side A to side B)
VDD3V3	8	Power	3.3 V Power
IO5	9	Digital I/O	IO5 (side A to side B)
IO6	10	Digital I/O	IO6 (side A to side B)
IO7	11	Digital I/O	IO7 (side A to side B)
IO8	12	Digital I/O	IO8 (side A to side B)
IO9	13	Digital I/O	IO9 (side A to side B)
IO10	14	Digital I/O	IO10 (side A to side B)
IO11	15	Digital I/O	IO11 (not used for routers)
VDD1V8	16	Power	1.8 V Power Input (from internal voltage regulator)
TRST~	17	Digital Input	JTAG Test Reset (active low)
VDD3V3	18	Power	3.3 V Power
TCK	19	Digital Input	JTAG Test Clock

Pin Name	Pin Number	Type	Description
TMS	20	Digital Input	JTAG Test Mode Select
TDI	21	Digital Input	JTAG Test Data In
TDO	22	Digital Output	JTAG Test Data Out
XIN	23	Oscillator In	Crystal oscillator Input
XOUT	24	Oscillator Out	Crystal oscillator Output
VDDPLL	25	Power	1.8 V Power Input (from internal voltage regulator)
GNDPLL	26	Power	Ground
VOUT1V8	27	Power	1.8 V Power Output (of internal voltage regulator)
RST~	28	Digital I/O	Reset (active low)
VIN3V3	29	Power	3.3 V Power Input
VDD3V3	30	Power	3.3 V Power
AVDD3V3	31	Power	3.3 V Power
CP0	32	Communi-cations	CP0: Receive serial data
AGND	33	Ground	Ground
CP1	34	Communi-cations	CP1: Transmit serial data
NC	35	N/A	Do Not Connect
GND	36	Ground	Ground
CP2	37	Communi-cations	CP2: External transceiver enable output
CP3	38	Communi-cations	CP3: Do Not Connect
CP4	39	Communi-cations	CP4: Collision detect input
CS0~	40	Digital I/O	SPI slave select 0 (active low)
VDD3V3	41	Power	3.3 V Power
VDD3V3	42	Power	3.3 V Power
SDA_CS1~	43	Digital I/O for Memory	I^2C: serial data (SDA) SPI: slave select 1 (active low)
VDD1V8	44	Power	1.8 V Power Input (from internal voltage regulator)
SCL	45	Digital I/O for Memory	I^2C: serial clock
MISO	46	Digital I/O for Memory	SPI master input, slave output (MISO)
SCK	47	Digital I/O for Memory	SPI serial clock
MOSI	48	Digital I/O for Memory	SPI master output, slave input (MOSI)
PAD	49	Ground Pad	Ground

Table 1: Router 5000 Chip Pin Description

Electrical Characteristics
Router 5000 Operating Conditions

Param-eter[1]	Description	Minimum	Typical	Maximum
V_{DD3}	Supply voltage	3.00 V	3.3 V	3.60 V
T_A	Ambient temperature	-40° C		+85° C
f_{XIN}	XIN clock frequency[2]	-	10.000 MHz	-
Tx Current	Current consumption[3] 5 – 80MHz		Rx current + 15 mA	Rx current + 15 mA
Rx Current	Current consumption[3] 5MHz 10MHz 20MHz 40MHz 80MHz		 9 mA 9 mA 15 mA 23 mA 38 mA	 15 mA 15 mA 23 mA 33 mA 52 mA

Table 2: Router 5000 Operating Conditions

Notes

1. *All parameters assume nominal supply voltage (V_{DD3} = 3.3 V ± 0.3 V) and operating temperature (T_A between -40ºC and +85ºC), unless otherwise noted.*
2. *See Clock Requirements in the* Series 5000 Chip Data Book *for more detailed information about the XIN clock frequency.*
3. *Assumes no load on digital I/O pins, and that the I/O lines are not switching.*

SPECIFICATIONS

Processor
Neuron 5000 Processor

Processor Input Clock
10 MHz

Operating Input Voltage
3.0 V DC to 3.6 V DC

RoHS-Compliant
The Router 5000 chip is compliant with the European Directive 2002/95/EC on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment.

EMC
Depends on network transceiver

Transmission Speed
Depends on network transceiver:
78 kbit/s for TP/FT-10 channel;
1250 kbit/s for TP/XF-1250 channel.
(See EIA-485 channel specification for transmission speed characteristics.)

Operating Temperature
-40 to 85°C

Operating Humidity
25-90% RH @50°C, non-condensing.

Non-operating Humidity
95% RH @ 50°C, non-condensing.

Reflow Soldering Temperature Profile
Refer to Joint Industry Standard document *IPC/JEDEC J-STD-020D.1* (March 2008).

Peak Reflow Soldering Temperature
260°C

Recommended Router 5000 Chip Pad Layout

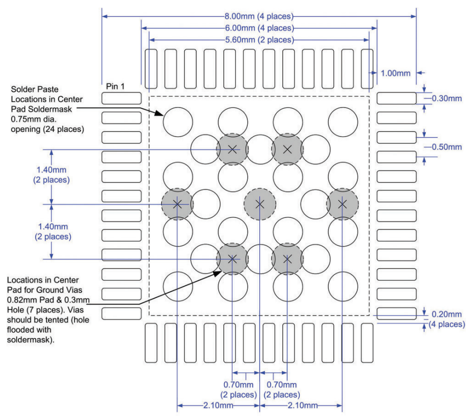
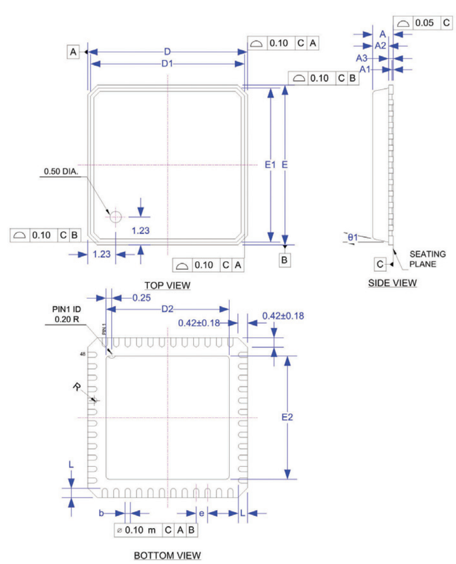


Figure 3: Router 5000 Chip Pad Layout

Router 5000 Chip IC Mechanical Specification



* CONTROLLING DIMENSION : MM

SYMBOL	MILLIMETER			INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	---	---	0.90	---	---	0.035
A1	0.00	0.01	0.05	0.00	0.0004	0.002
A2	---	0.65	0.70	---	0.026	0.028
A3	0.20 REF.			0.008 REF.		
b	0.18	0.23	0.30	0.007	0.009	0.012
D	7.00 bsc			0.276 bsc		
D1	6.75 bsc			0.266 bsc		
D2	5.20	5.40	5.60	0.205	0.213	0.220
E	7.00 bsc			0.276 bsc		
E1	6.75 bsc			0.266 bsc		
E2	5.20	5.40	5.60	0.205	0.213	0.220
L	0.30	0.40	0.50	0.012	0.016	0.020
e	0.50 bsc			0.020 bsc		
θ1	0°	---	12°	0°	---	12°
R	0.09	---	---	0.004	---	---
TOLERANCES OF FORM AND POSITION						
aaa	0.10			0.004		
bbb	0.10			0.004		
ccc	0.05			0.002		

Figure 4: Router 5000 Chip IC Mechanical Specifications

Notes

1. *All dimensions are in millimeters.*
2. *Dimensions and tolerances conform to ASME Y14.5M.-1994.*
3. *Package warpage max. 0.08 mm.*
4. *Package corners unless otherwise specified are R0.175±0.025 mm.*

ORDERING INFORMATION

Router 5000 Chip
14315R-100

 P/N 003-0508-01A