RS485 transceiver

v1.0.0

Saturday, 03 September 2016

# Revision history

|  |  |  |  |
| --- | --- | --- | --- |
| Date | Version | Description | Author |
| 2016-09-03 | 1.0 | Initial specification | Dominik Guz |
|  |  |  |  |

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# Architectural Representation

## purpose

Circuit specification for RS485 transceiver.

## scope

Specification of circuit parameters along with list of used components.

Proposed circuit model and drawing of specified circuit.

## references

|  |  |
| --- | --- |
| [1] | T. Kugelstadt, The RS-485 Design Guide, Texas Instruments, 2008. |

## definitions

# Architectural Goals and Constraints

## Non-functional requirements

1. Middle sized package, TSOP preferable.
2. ESD protection standards compliant

## functional requirements

1. Transmit and receive capability on RS-485 half-duplex bus.
2. Low power consumption
3. Transmit enabling signal polarity compatible with built-in MCU UASRT modules
4. Connector for wires 24-28 AWG
5. Minimum 32 bus nodes limit

## environmental requirements

## Dependency requirements

## Operating conditions

1. Temperature ranges : -20°C -> 80°C

# Requirements analysis

## Circuit parameters

### Operating condtions

### Voltage ranges

1. Power supply 2.8 – 3.5V
2. Logic levels CMOS compatible

### Power consumption

1. <5mA Active mode consumption

### Frequency ranges

1. >100Kbps data rates

### Dimensions

1. < 2 cm2

## Components comparision

### Manufacturers list

1. Texas Instruments
2. Maxim Integrated
3. Linear Technology

### Comparison table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Part Code | Manufacturer | Available | Price/1unit($) | Meets Non-Func Req | Publication Date | Extras |
| SN65HVD1781-Q1 | Texas Instruments | Y | 4.55 | Y | 2010 | 320 Nodes, 1Mbps |
| LTC1480 | Linear Technology | Y | 5.15 | Y |  | Very low power |
| MAX3483ECSA+T | Maxim Integrated | Y | 5.22 | Y |  | Slew-rate redo, EMI filter |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

## Component selection

### Matching components list

1. SN65HVD1781-Q1
2. LTC1480
3. MAX3483ECSA+T

### Optimization goals

1. Price for single unit
2. Favor extra features for comparably priced units

## Component specification

* **SN65HVD1781-Q1**
* Qualified for Automotive Applications
* AEC-Q100 Qualified With the Following Results
* Device Temperature Grade 1:   
  –40°C to 125°C Ambient Operating Temperature Range
* Device HBM ESD Classification Level H2
* Device CDM ESG Classification Level C3B
* Bus-Pin Fault Protection to:
* > ±70 V ('HVD1780-Q1, 'HVD1781-Q1)
* > ±30 V ('HVD1782-Q1)
* Operation With 3.3-V to 5-V Supply Range
* ±16-kV HBM Protection on Bus Pins
* Reduced Unit Load for up to 320 Nodes
* Failsafe Receiver for Open-Circuit, Short-Circuit and Idle-Bus Conditions
* Low Power Consumption
* Low Standby Supply Current, 1 μA Maximum
* ICC 4-mA Quiescent During Operation
* Pin-Compatible With Industry-Standard SN75176

# Circuit model

## Block diagram

# Circuit drawing



# Circuit simulation results

# Implementation notes

* 1. Differential pair of A/B signals between transceiver output and connector. Keep as short as possible.

# Issues and concerns