F81485

5V Low Power RS-485 Interface Transceiver

Release Date: March, 2013
Version: V0.14P

F81485 Datasheet Revision History

Version	Date	Page	Revision History
V0.10P	2011/12	-	Preliminary
V0.11P	2012/01	-	Made Clarification and Correction Update Top Marking Specification Update Differential Input Threshold Spec.
V0.12P	2012/02	-	Made Clarification and Correction. Update Operating Temperature
V0.13P	2012/03	-	Made Clarification and Correction. Update Electrical Characteristics (Add Symbol, Testing Figures, spec…)
V0.14P	2013/03	-	Made Clarification and Correction. Update ESD spec. to ±15KV Contact

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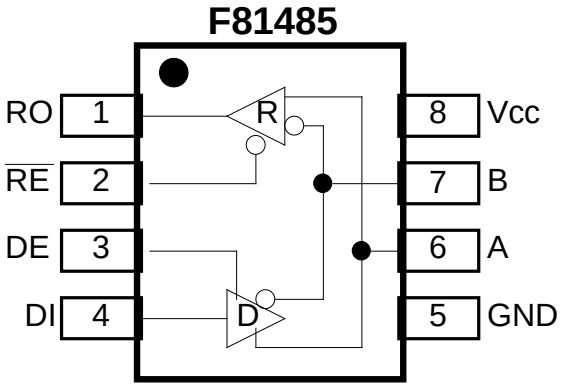
1 General Description

The F81485 is a CMOS design, features with single 5 V power supply, and low power differential bus/line transceiver suitable for the multipoint data transmission EIA standard RS485 and RS422 applications. The extended common-mode range is −7 V to +12 V. Both the driver and the receiver can be enabled independently. The driver and receiver feature three-state outputs, with the driver outputs maintaining high impedance over the entire common-mode range. Excessive power dissipation caused by the bus contention or faults is prevented by a thermal shutdown circuit which forces the driver outputs into a high impedance state. The receiver contains a fail-safe feature that results in a logic high output state if the inputs are unconnected (floating). Up to 32 transceivers can be connected simultaneously on a bus, but only one driver should be enabled at any time. The F81485 features extremely fast switching speeds. Minimal driver propagation delays permit transmission at data rates up to 10 Mbps while low skew minimizes EMI interference. All inputs and outputs contain protection against ESD; all driver outputs feature high source and sink current capability. An epitaxial layer is used to guard against latch-up.

2 Feature List

- Single 5V Supply
- Meets EIA RS-485 Standard
- High Speed, Low Power CMOS
- -7V to 12V Bus Common-Mode Range Permits
- ±7V Ground Difference Between Devices on the Bus
- ESD IEC 61000-4-2 ±15KV Contact Discharge Testing
- 70mV Typical Input Hysteresis
- Driver propagation delay: 40 ns typical
- Receiver propagation delay: 70 ns typical
- High-Z outputs with power off
- 8 Pin SOP Packaging

3 Pin Configuration



4 Pin Description

IN_t	- TTL level input pin.
O_4	- Output pin with 4mA driver.
P	- Power.

4.1. Power Pin

Pin	Pin Name	Type	Description
5	GND	P	GND.
8	VCC	P	4.75V< VCC < 5.25V power supply voltage input.

4.2. Transceiver

Pin	Pin Name	Type	Description
1	RO	O_4	Receiver Output. When enabled (RE# is low), then if A > B by 200 mV, RO is high. A < B by 200 mV, RO is low.
2	RE#	IN_t	Active Low Receiver Output Enable pin. A low level enables the receiver output, RO. A high level places it in a high impedance state.
3	DE	IN_t	Active High Driver Output Enable. A high level enables the driver differential outputs, A and B. The chip will function as a line driver. A low level places it in a high impedance state.
4	DI	IN_t	Driver Input. When the driver is enabled (DE is high), a logic low on DI forces A low and B high, while a logic high on DI forces A high and B low.
6	A	I/O	Non-inverting Receiver Input A/Driver Output A.
7	B	I/O	Inverting Receiver Input B/Driver Output B.

5 Electrical Characteristics

5.1 Absolute Maximum Ratings

PARAMETER		RATING	UNIT
Vcc		6	V
Input Voltage	Logic	-0.3 to Vcc +0.5	V
	Drivers	-0.3 to Vcc +0.5	V
	Receivers	±15	
Output Voltage	Logic	-0.3 to Vcc +0.5	V
	Drivers	±15	V
	Receivers	-0.3 to Vcc +0.5	
Storage Tempreature		-65 to +150	°C
Lead Temperature (soldering, 10s)		+300	°C
Power Disspation		500	mW

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device

Test condition: VCC = 5V

PARAMETER	SYMBOL	MIN.	TYP.	MAX	UNIT	CONDITIONS
Supply Voltage	Vcc	4.75		5.25	V	
Supply Current	Icc		900		μA	No Load
Operating Temperature (1)	T	-40		85	◦ C	

Note (1): Design Guarantee –40 ℃ ≤ T ≤ 85 °C

5.2 Driver Section

Test condition: VCC = 5V

PARAMETER	SYMBOL	MIN.	TYP.	MAX	UNIT	CONDITIONS
DC Characteristics						
Differential Output Voltage (See Figure 1)	V_{OD}	GND		Vcc	V	Unloaded, R= ∞
		2		Vcc	V	With load, R = 50Ω (RS422)
		1.5		Vcc	V	With load, R = 27Ω (RS485)
Differential Output Voltage for Complimentary States (See Figure 1)	ΔV_{OD}			0.2	V	R = 27Ω or R = 50Ω
Driver Common-Mode Output Voltage (See Figure 1)	V_{OC}			3	V	R = 27Ω or R = 50Ω
Input High Voltage	V_{INH}	2.0			V	Applies to DE, DI, RE#
Input Low Voltage	V_{INL}			0.8	V	Applies to DE, DI, RE#
Input Current	I_{IN}			±10	μA	Applies to DE, DI, RE#
Driver Short Current	I_{DSC}	35		250	mA	VOUT = High, -7V ≤ Vo ≤ +12V
		35		250	mA	VOUT = Low, -7V ≤ Vo ≤ +12V

PARAMETER	SYMBOL	MIN.	TYP.	MAX	UNIT	CONDITIONS
AC Characteristics						
Maximum Data Rate	-	10			Mbps	RE# = 5V, DE = 5V
Driver Input to Output (See Figure 3)	t_{DPLH}, t_{DPHL}	20	40	60	ns	t_{PLH}; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF
	t_{DPLH}, t_{DPHL}	20	40	60	ns	t_{PHL}; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF
Driver Skew	$\|t_{DPLH} - t_{DPHL}\|$		5	10	ns	t_{SKEW} = $\|t_{DPLH} - t_{DPHL}\|$
Driver Rise or Fall Time	t_R , t_F	3	15	40	ns	10% to 90%, R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF
Driver Enable to Output High (See Figure 4)	t_{DZH}		40	70	ns	C_{L1} = 100pF
Driver Enable to Output Low (See Figure 4)	t_{DZL}		40	70	ns	C_{L1} = 100pF
Driver Disable Time from Low (See Figure 4)	t_{DLZ}		40	70	ns	C_{L1} = 100pF
Driver Disable Time from High (See Figure 4)	t_{DHZ}		40	70	ns	C_{L1} = 100pF

5.3 Receiver Section

Test condition: VCC = 5V

PARAMETER	SYMBOL	MIN.	TYP.	MAX	UNIT	CONDITIONS
DC Characteristics						
Differential Input Threshold	V_{TH}	-300		+0	mV	-7V ≤ V_{CM} ≤ +12V
Input Hysteresis	Δ V_{TH}		70		mV	V_{CM} = 0V
Output Voltage High	V_{OH}	3.5			V	I_o = -4mA, V_{ID} = +200mV
Output Voltage Low	V_{OL}			0.4	V	I_o = +4mA, V_{ID} = -200mV
Output Current	I_{CC}			±1	μA	0.4V ≤ Vo ≤ 2.4V, RE# = -5V
Input Resistance	R_{IN}	12	15		KΩ	-7V ≤ V_{CM} ≤ +12V
Input Current (A,B), V_{IN} = 12V	I_{IN}			+1.0	mA	DE = 0V, V_{cc} = 0V or 5.25V, V_{IN} = 12V
Input Current (A,B), V_{IN} = -7V	I_{IN}			-0.8	mA	DE = 0V, V_{cc} = 0V or 5.25V, V_{IN} = -7V
Short Circuit Current	I_{SCC}	7		95	mA	0V ≤ V_{CM} ≤ V_{cc}

PARAMETER	SYMBOL	MIN.	TYP.	MAX	UNIT	CONDITIONS
AC Characteristics						
Maximum Data Rate	-	10			Mbps	RE# = 0V, DE = 0V
Receiver Input to Output (See Figure 3)	t_{PHL}, t_{PLH}	60	70	200	ns	t_{PLH}; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF
	t_{PHL}, t_{PLH}	60	70	200	ns	t_{PHL}; R_{DIFF} = 54Ω, C_{L1} = C_{L2} = 100pF
Receiver Skew	$\|t_{PHL} - t_{PLH}\|$		15		ns	t_{SKEW} = $\|t_{DPLH} - t_{DPHL}\|$
Receiver Enable to Output Low	t_{ZL}		20	50	ns	C_{RL} = 15pF, See Figure 2
Receiver Enable to Output High	t_{ZH}		20	50	ns	C_{RL} = 15pF, See Figure 2
Receiver Disable Time from Low	t_{LZ}		20	50	ns	C_{RL} = 15pF, See Figure 2
Receiver Disable Time from High	t_{HZ}		20	50	ns	C_{RL} = 15pF, See Figure 2

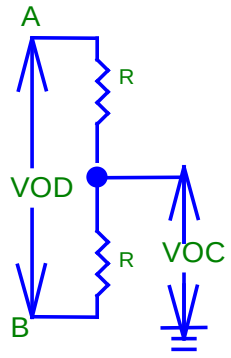


Figure 1: RS-485 Driver Test Load Circuit

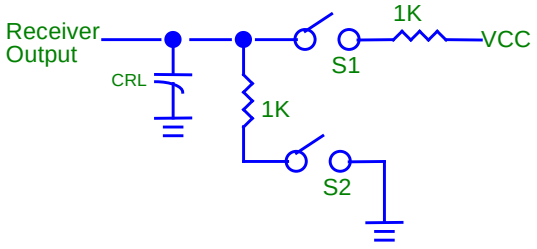


Figure 2: Receiver Timing Test Load Circuit

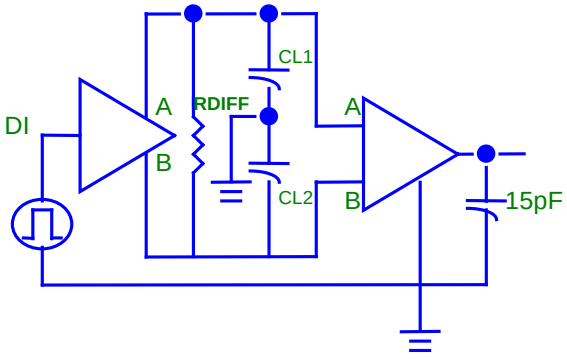


Figure 3: RS-485 Driver/Receiver Timing Test Circuit

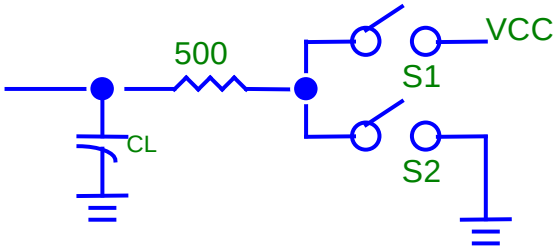


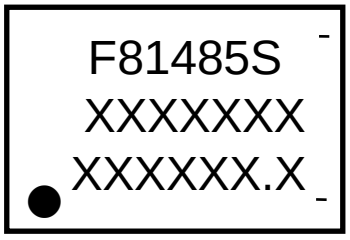
Figure 4: RS-485 Driver Timing Test Load Circuit

6 Ordering Information

Part Number	Package Type
F81485S	8-SOP Green Package

7 Top Marking Specification

The version identification is shown as the bold red characters. Please refer to below for detail:



1st Line: Fintek Logo

2nd Line: Device Name → **F81485S,** where S means 8-SOP package

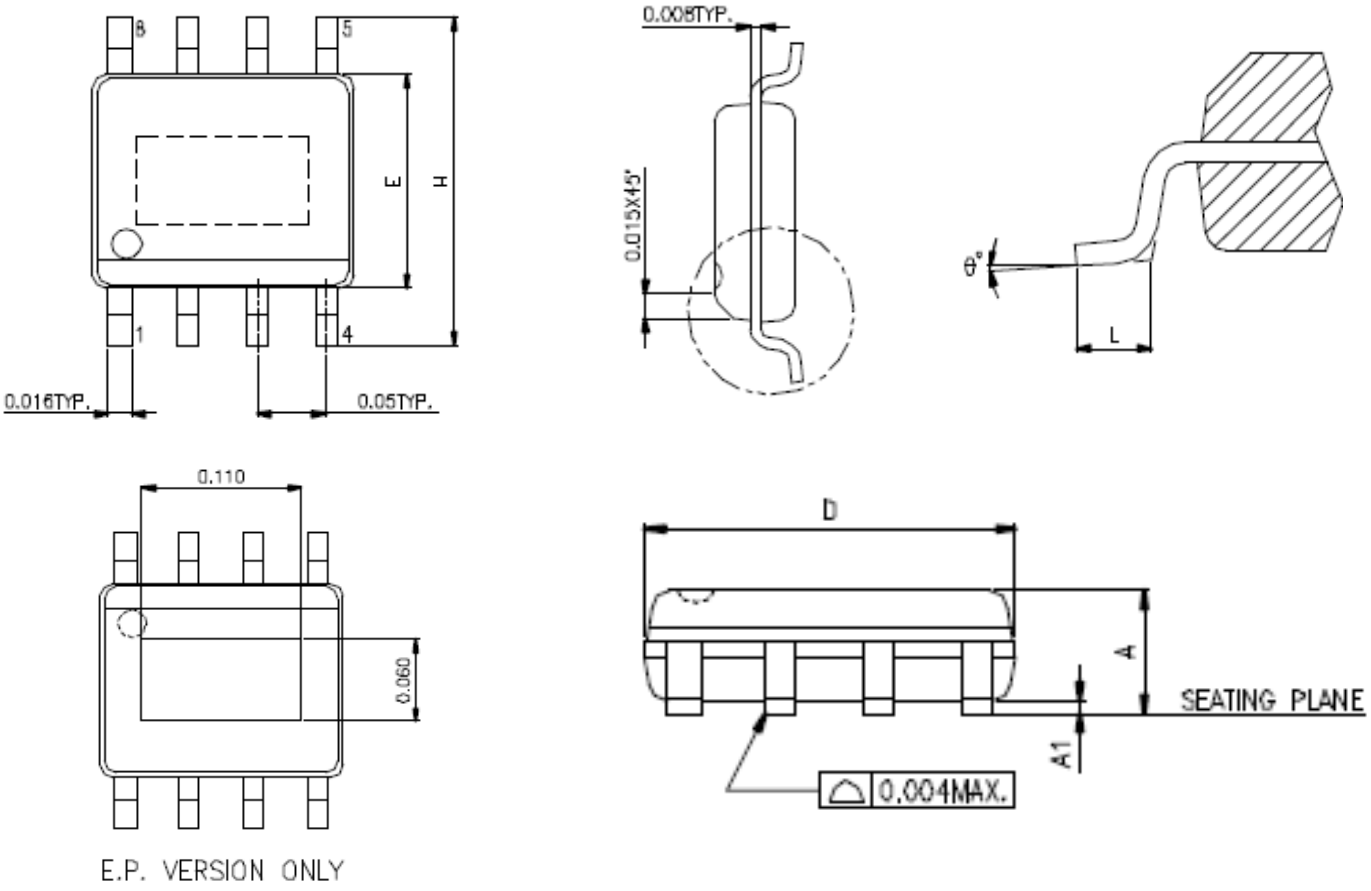
2nd Line: Assembly Plant Code (X) + Assembled Year Code (X) + Week Code (XX) + Fintek Internal Code (XX) + IC Version (X) where A means version A, B means version B, …

3rd Line: Wafer Fab Code (XXXX…XX)

● : Pin 1 Identifier

8 Package Spec.

8-SOP Package



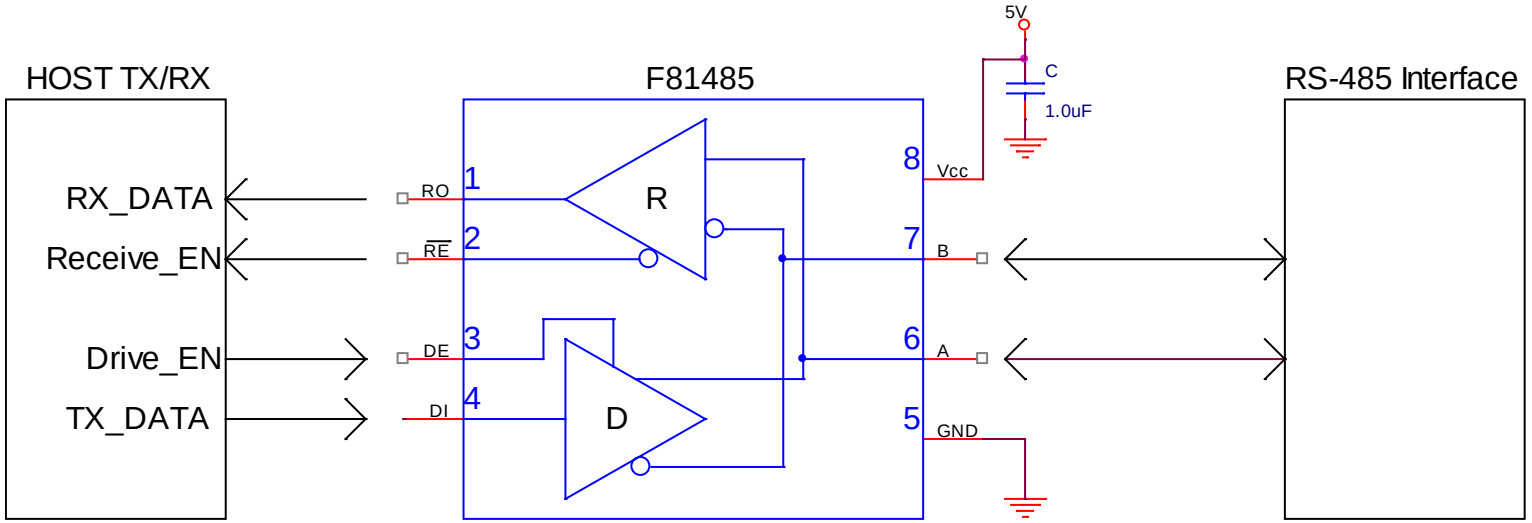
E.P. VERSION ONLY

SYMBOLS	MIN.	MAX.
A	0.053	0.069
A1	0.004	0.010
D	0.189	0.196
E	0.150	0.157
H	0.228	0.244
L	0.016	0.050
θ°	0	8

UNIT : INCH

NOTES:
1. JEDEC OUTLINE : MS-012 AA / E.P. VERSION : N/A
2. DIMENSIONS "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .15mm (.006in) PER SIDE.
3. DIMENSIONS "E" DOES NOT INCLUDE INTER-LEAD FLASH, OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .25mm (.010in) PER SIDE.

9 Application Circuit



MODE SELECTION

/RE	DE	MODE
0	0	RS485 Recieve
1	1	RS485 Drive
0	1	RS485 LoopBack
1	0	Dis_RS485

Title		
Size B	Document Number F81485	Rev A
Date: Friday, November 18, 2011	Sheet 1 of 1	