



安勤科技股份有限公司

APPROVAL SHEET

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料號	E14S4143500H
品名	Fintek F81435N QFN-40(5x5) SMD RS232/422 /485 Multiprotocol Transceiver (HF)
製造商	Fintek
製造商型號	F81435N

Update 原因說明	
庫存說明	
其它	



安勤科技 測試報告

測試日期	2022-06-07 04:52:07		測試樣品數	3 PCS
測試項目	項目	測試條件		結果
	外觀	Check Mfr, MPN, Photo, Marking		Pass
	材質			
	電氣特性			
	機械強度			
	實裝動作			
	破壞實驗			
	顏色			
	尺寸	依機構尺寸圖測量符合需求		Pass
	沾錫性			
	壽命實驗			
	安規			
	其它測試			
使用儀器	游標卡尺			
備註				
測試結果	符合測試條件及規格			

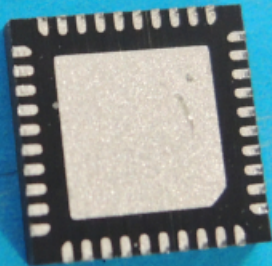
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Workflow

Workflow Status	Action	Signoff User	Local Client Time	Signoff Comments
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F81435

Logic Side Low Level 3T5R RS232/ RS422/ RS485 Multi-Protocol Transceiver

Release Date: October 2020

Version: V0.13P

F81435 Datasheet Revision History

Version	Date	Revision History
V0.10P	2020/03	<ul style="list-style-type: none"> ● Preliminary Version
V0.11P	2020/04	<ul style="list-style-type: none"> ● Made Clarification and Modification ● Update General Description ● Update Feature List ● Update Section 4.2 Transceiver ● Update Function Description ● Update Section 6.2 DC Characteristics ● Update Application Circuit
V0.12P	2020/07	<ul style="list-style-type: none"> ● Made Clarification and Modification ● Update Section 4.3 Charge Pump, Mode Select and Other Function ● Update Feature List ● Update Figure 2 ccTalk Mode ● Update Electrical Characteristics ● Delete external resistors: <ul style="list-style-type: none"> <input type="checkbox"/> Update Section 5.1 Mode Selection <input type="checkbox"/> Modify Figure of Section 5.3 RS-422/ RS-485 with Termination Resistor Mode Description <input type="checkbox"/> Update Application Circuit
V0.13P	2020/10	<ul style="list-style-type: none"> ● Made Clarification and Modification ● Update Section 4.3 Charge Pump, Mode Select & Other Functions ● Add Table in Section 5.2.2 ccTalk Mode (Mode 011) ● Add Tables and Update Figures in Section 5.3 RS-422/RS-485 Mode Description ● Update Electrical Characteristics ● Update Application Circuit

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1 General Description

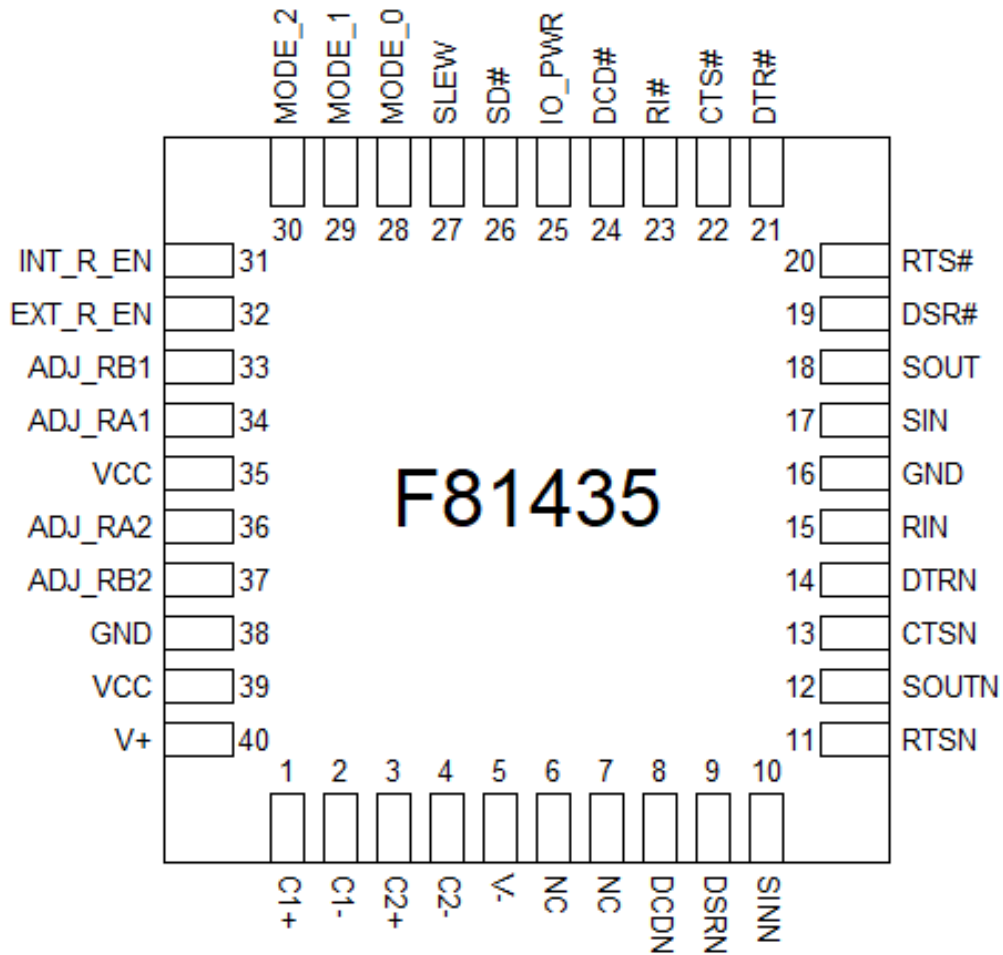
The F81435 is programmable, monolithic multi-protocol transceiver device that contains RS-232 and RS-485/RS-422 drivers and receivers. The F81435 can be reconfigured into eight operating modes including three set of 1T/1R RS-422 full duplex, one set of 3T/5R RS-232, three set of 1T/1R RS-485 half duplex, and ccTalk with S INN as open drain output. Termination and bias resistors can be selected whenever you need by changing the logic state of pin 31 (INT_R_EN) and pin 32 (EXT_R_EN) selection pins.

The extra charge pumps deliver true RS-232 driver output voltage from a single power supply at either 3.3V or 5V. I/O power (minimum 1.8V) is for the controller side's power. The F81435 requires only four 0.1 μ F capacitors for the charge pump. This item converts the 5 V input power to the ± 10 V (nominal) required for RS-232 output levels. The F81435 meets the EIA-232-E V0.28 specification while using a single digital 3.3V or 5 V supply and particularly suites for those applications where ± 12 V is not available. A slew rate control pin configures driver outputs for either high data rate or slew-controlled data rates. Slew-controlled outputs minimize the problems that caused by the reflections and ringing on long or un-terminated cables.

2 Feature List

- 3.3V ~ 5V Single Supply Operation
- Support I/O Power 1.8V to 5.0V
- RS-232 Data Rate 3Mbps (Max. Load 100pF)
- [RS-422](#)/RS-485 Data Rate 20Mbps (Max. Load 47pF)
- [RS-422](#)/RS-485 Advance Failsafe for Open, Short or Terminated
- Adjustable Slew Rate for Minimize EMI Error
- Flexible 8 Operation Modes Selected by 3 Configuration Pins for F81435
 - i. 1T/1R RS-422 full duplex. TX enable high active.
 - ii. 3T/5R Pure RS-232.
 - iii. 1T/1R RS-485 half duplex. TX enable high active.
 - iv. ccTalk with S INN as open drain output.
 - v. 1T/1R RS-422 full duplex. TX enable low active.
 - vi. 1T/1R RS-485 half duplex. TX enable low active with auto sensing.
 - vii. 1T/1R RS-485 half duplex. TX enable low active
 - viii. 1T/1R RS-422 full duplex. TX enable low active with auto sensing.
- Nominal $\pm 10V$ Driving Output Swing for +5V input
- $\pm 16.5V$ Receiver Input Voltage Range
- Package in 40 QFN (5mm x 5mm)

3 Pin Configuration



4 Pin Description

AIN	— Analog Input pin
AOUT	— Analog output pin
O ₄	— Output with 4mA driver.
IN _t	— Input pin.
Pump	— Charge pump
P	— Power

4.1 Power Pin

Pin	Pin Name	Type	Description
25	IO_PWR	P	Support I/O Power 1.8V to 5V
35,39	VCC	P	3.3~5V power supply voltage input
16,38	GND	P	GND.

4.2 Transceiver

Pin	Pin Name	Type	Description		
			Pure RS-232	RS-422 Full-Duplex	RS-485 Half-Duplex
8	DCDN	AIN/AOUT	Receiver Input	T(B)-	R(B)-/ T(B)-
9	DSRN	AIN	Receiver Input	NC	NC
10	SINN	AIN/AOUT	Receiver Input	T(A)+	R(A)+/ T(A)+
11	RTSN	AOUT	Driver Output	NC	NC
12	SOUTN	AIN/AOUT	Driver Output	R(A)+	NC
13	CTSN	AIN	Receiver Input	NC	NC
14	DTRN	AIN/AOUT	Driver Output	R(B)-	NC
15	RIN	AIN	Receiver Input	NC	NC
17	SIN	O ₄	Receiver Output	Receiver Output	Receiver Output
18	SOUT	IN _t	Driver Input	Driver Input	Driver Input
19	DSR#	O ₄	Receiver Output	NC	NC
20	RTS#	IN _t	Driver input	DE#RE	DE#/RE
21	DTR#	IN _t	Driver Input	NC	NC
22	CTS#	O ₄	Receiver Output	NC	NC
23	RI#	O ₄	Receiver Output	NC	NC
24	DCD#	O ₄	Receiver Output	NC	NC

* : DE#/RE → 0: Driving enable, 1:Receiver Enable; DE/RE# → 0: Receiver Enable, 1: Driving enable

4.3 Charge Pump, Mode Select & Other Functions

Pin	Pin Name	Type	Description
1	C1+	Pump	Positive terminal of negative flying capacitor.
2	C1-	Pump	Negative terminal of positive flying capacitor.
3	C2+	Pump	Positive terminal of negative flying capacitor.
4	C2-	Pump	Negative terminal of positive flying capacitor.
5	V-	Pump	Negative charge pump output for storage capacitor.
40	V+	Pump	Positive charge pump output for storage capacitor.
26	SD#	IN _t	Shutdown pin, Internal pull high \approx 400K Ω 0: Shutdown mode 1: Normal mode (default)
27	SLEW	IN _t	Slew rate control pin, Internal pull high \approx 625K Ω . 1: RS-232 to 3 Mbps or RS-485/RS-422 to 20 Mbps. 0: Logic low input will limit driver slew rate to 250Kbps for RS-232 and RS-485/RS-422.
28	MODE_0	IN _t	Mode selection pin_0. Internal pull high \approx 625K Ω . As the current is very small (\approx 8 μ A), please use the hardware strapping or GPIO (BIOS) to select the modes.
29	MODE_1	IN _t	Mode selection pin_1. Internal pull high \approx 625K Ω . As the current is very small (\approx 8 μ A), please use the hardware strapping or GPIO (BIOS) to select the modes.
30	MODE_2	IN _t	Mode selection pin_2. Internal pull high \approx 625K Ω . As the current is very small (\approx 8 μ A), please use the hardware strapping or GPIO (BIOS) to select the modes.
31	INT_R_EN	IN _t	Internal resistor switch control for RS-422/ RS-485 mode with resistors.
32	EXT_R_EN	IN _t	External resistor switch control for RS-422/ RS-485 mode with resistors.
33	ADJ_RB1	Pump	External resistor connected to ADJ_RB1, this pin is for RS-485 and RS-422
34	ADJ_RA1	Pump	External resistor connected to ADJ_RA1, this pin is for RS-485 and RS-422
36	ADJ_RA2	Pump	External resistor connected to ADJ_RA2, this pin is only for RS-422
37	ADJ_RB2	Pump	External resistor connected to ADJ_RB2, this pin is only for RS-422

4.4 NC

Pin	Description
6, 7	NC Pin.

5 Function Description

The F81435 is programmable, monolithic multi-protocol transceiver device that contains RS-232 and RS-485 / RS-422 drivers and receivers. The F81435 can be reconfigured into eight operating modes including three set of 1T/1R RS-422 full duplex, one set of 3T/5R RS-232, three set of 1T/1R RS-485 half duplex, and ccTalk with S INN as open drain output. Termination and bias resistors can be selected whenever you need by changing the logic state of pin 31 (INT_R_EN) and pin 32 (EXT_R_EN) selection pins.

The extra charge pumps deliver true RS-232 driver output voltage from a single power supply at either 3.3V or 5V. I/O power (minimum 1.8V) is for the controller side's power. The F81435 requires only four 0.1 μ F capacitors for the charge pump. This item converts the 5 V input power to the ± 10 V (nominal) required for RS-232 output levels. The F81435 meets the EIA-232-E V0.28 specification while using a single digital 3.3V or 5 V supply and particularly suites for those applications where ± 12 V is not available. A slew rate control pin configures driver outputs for either high data rate or slew-controlled data rates. Slew-controlled outputs minimize the problems that caused by the reflections and ringing on long or un-terminated cables.

5.1. Mode Selection

The RS-485/RS-422 drivers and receivers are differential data transmission. RS-232 drivers and receivers are single-ended with the inverting outputs. The F81435 drivers and receivers can be configured to operate either as the standard RS-232, RS-422, or RS-485 devices. It can be configured into eight operating modes by pin 28, 29 and 30 (these pins of Mode_0/1/2) per Table 1. In addition, the internal and external resistors switch could be controlled through pin 31 (INT_R_EN) and pin 32 (EXT_R_EN), as shown in Table 2.

Table 1. Mode Select Configuration for F81435

Pin 28 MODE_0	Pin 29 MODE_1	Pin 30 MODE_2	Mode	Status
0	0	0	RS-422 Full Duplex	<ul style="list-style-type: none"> ● 1T/1R RS-422 ● TX Enable High Active. ● Check Table 2 for choosing the related resistor.
0	0	1	Pure RS-232	3T/5R RS-232.
0	1	0	RS-485 Half Duplex	<ul style="list-style-type: none"> ● 1T/1R RS-485. ● TX Enable High Active. ● Check Table 2 for choosing the related resistor.
0	1	1	ccTalk	ccTalk with SINN as Open Drain output.
1	0	0	RS-422 Full Duplex	<ul style="list-style-type: none"> ● 1T/1R RS-422. ● TX Enable Low Active. ● Check Table 2 for choosing the related resistor.
1	0	1	RS-485 Half Duplex	<ul style="list-style-type: none"> ● 1T/1R RS-485, ● TX Enable Low Active with Auto Sensing (also mean auto direction control) ● Check Table 2 for choosing the related resistor.
1	1	0	RS-485 Half Duplex	<ul style="list-style-type: none"> ● 1T/1R RS-485, ● TX Enable Low Active. ● Check Table 2 for choosing the related resistor.
1	1	1	RS-422 Full Duplex	<ul style="list-style-type: none"> ● 1T/1R RS422 ● TX Enable Low Active with Auto Sensing (also mean auto direction control) ● Check Table 2 for choosing the related resistor.

Table 2. Resistors Allocation for Mode (000/010/100/101/110/111)

Pin 31 INT_R_EN	Pin 32 EXT_R_EN	Status
0	0	No resistors
0	1	Enable switch for external adjustable resistors
1	0	Enable switch for internal resistors
1	1	Enable switches for internal and external resistors

5.2. RS-232 and ccTalk Mode Description

The following sections will introduce the RS-232 (Mode 001) and ccTalk (Mode 011), respectively.

5.2.1 RS-232 (Mode 001)

The F81435 supports all signals used in RS-232 over an RJ-45 as defined in TIA/EIA-561. For DTE serial port only three drivers are required. F81435 may also be used to implement a standard serial port over a DB-9 connector (TIA/EIA-574 or the standard IBM serial port). In that case either DSR or RI signal can be supported. Both DSR and RI are used mainly for dial-up connections and are typically not needed on dedicated lines. If both signals are required, add a discrete transceiver such as F81435.

An alternative implementation would be using the F81435 to emulate the functionality of up to five -channel RS-232 transceivers.

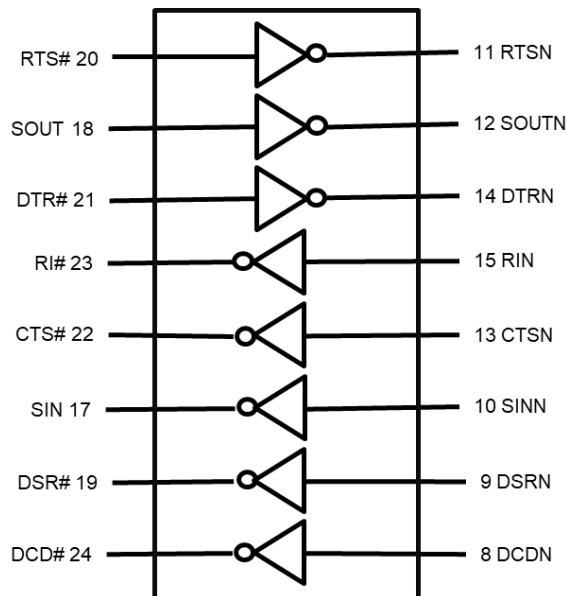


Figure 1. RS-232 Mode (Mode 001)

Table 3. RS-232 Mode

DRIVERS		RECEIVERS	
Input	Output	Input	Output
0	Space	Space*	0
1	Mark	Mark**	1
Open	Mark	Open	1

* Space mean voltage is positive

** Mark mean voltage is negative

5.2.2 ccTalk Mode (Mode 011)

In the ccTalk Mode, SINN as open drain output.

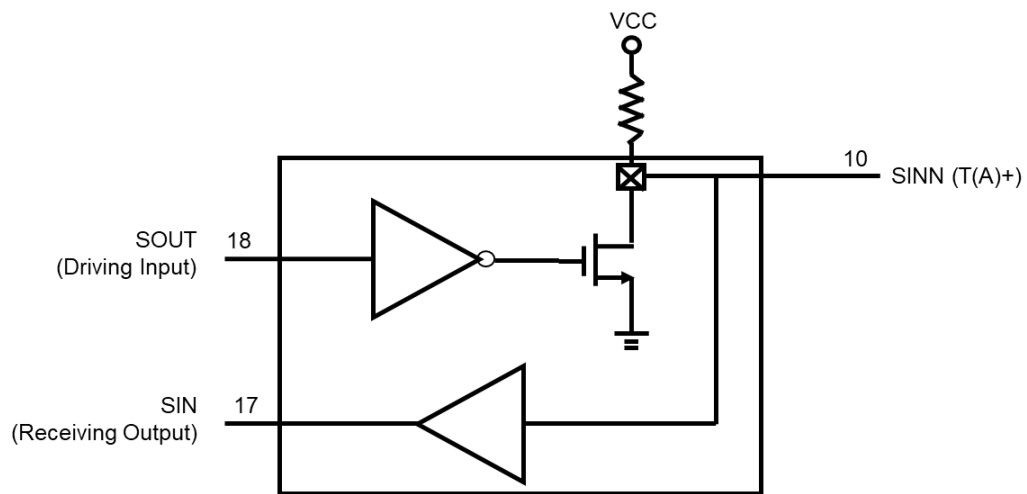


Figure 2. ccTalk Mode (Mode 011)

Table 4. Transmitting and Receiving States

Transmitting		
Input		Output
Pin 26 SD#	Pin 18 SOUT	Pin 10 SINN
H	0	0
H	1	1
L	1	1
Receiving		
Input		Output
Pin 26 SD#	Pin 10 SINN	Pin 17 SIN
H	1	1
H	0	0
L	1	1

5.3. RS-422/ RS-485 Mode Description

As the above Table 1 described, there are each 3 modes for RS-422 and RS-485. The following sections are going to introduce the different RS-422 and RS-485 modes accompanying with pin 31 (INT_R_EN) and pin 32 (EXT_R_EN) respectively.

5.3.1. RS-422 Full Duplex (Mode 000)

This mode is TX enable high active mode. Below Figure 3 and Figure 4 demonstrate only for the RS-422 without resistors mode and enable switch for internal and external resistors mode as per Table 2. In addition, transmitting and receiving states of RS-422 mode (mode 000) is described in detail at Table 5.

Set pin 31 (INT_R_EN) low and pin 32 (EXT_R_EN) low, the RS-422 full duplex transceiver has no resistors, as below Figure 3.

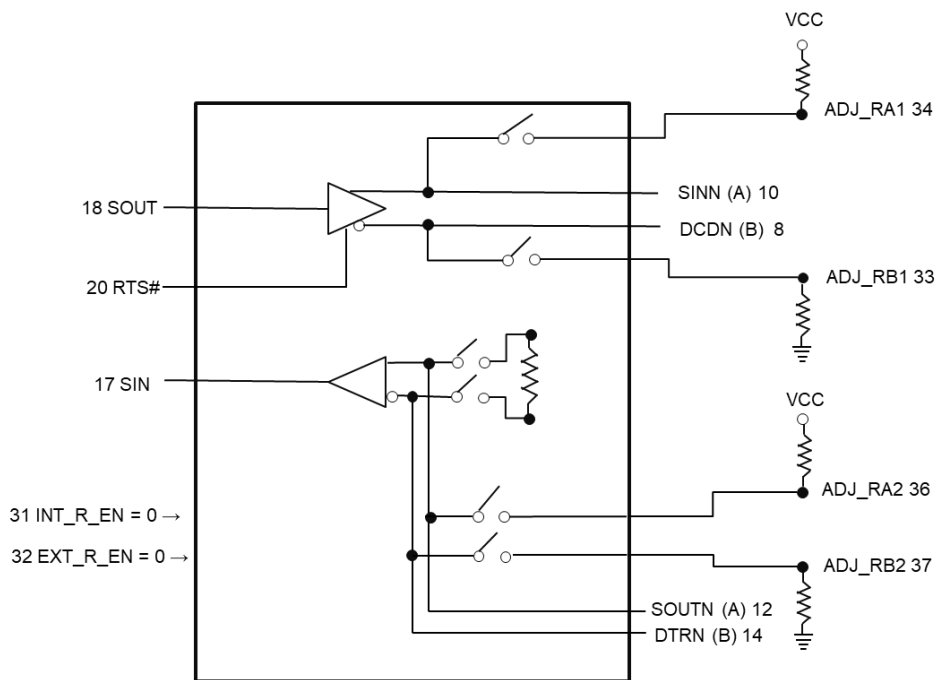


Figure 3. RS-422 without Resistors

Set pin 31 (INT_R_EN) high and pin 32 (EXT_R_EN) high, the RS-422 full duplex has enabled switch for external and internal resistors, as below Figure 4.

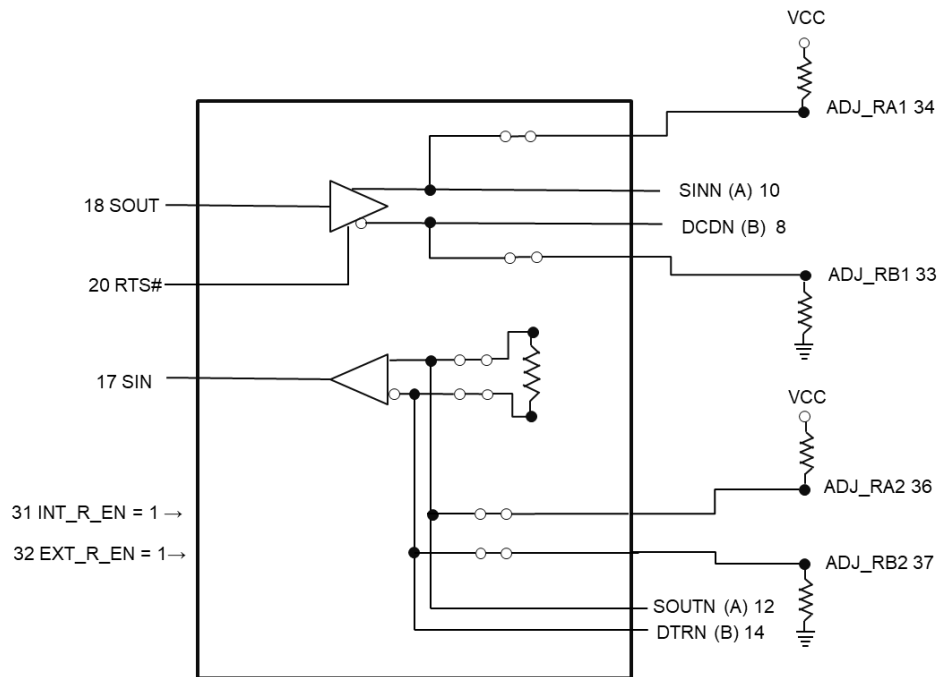


Figure 4. RS-422 with Internal and External Resistors

Table 5. Transmitting and Receiving States

Transmitting					
Input			Output		
Pin 26 SD#	Pin 20 RTS#	Pin 18 SOUT	ACTION	Pin 10 SINN	Pin 8 DCDN
H	1	0	Turn Driver ON	0	1
H	1	1	Turn Driver ON	1	0
H	0	1	Turn Driver OFF	High Impedance	High Impedance
L	X	X	X	High Impedance	High Impedance
Receiving					
Input		Output			
Pin 26 SD#	A-B	Pin 17 SIN			
H	$\geq +200\text{mV}$	1			
H	$\leq -200\text{mV}$	0			
L	X	1			

5.3.2. RS-422 Full Duplex (Mode 100)

This mode is TX enable low active mode. Below Figure 5 and Figure 6 demonstrate only for RS-422 without resistors mode and enable switch for internal and external resistors mode per Table 2. In addition, transmitting and receiving states of RS-422 (mode 100) described in Table 6.

Set pin 31 (INT_R_EN) low and pin 32 (EXT_R_EN) low, the RS-422 full duplex transceiver has no resistors, as below Figure 5.

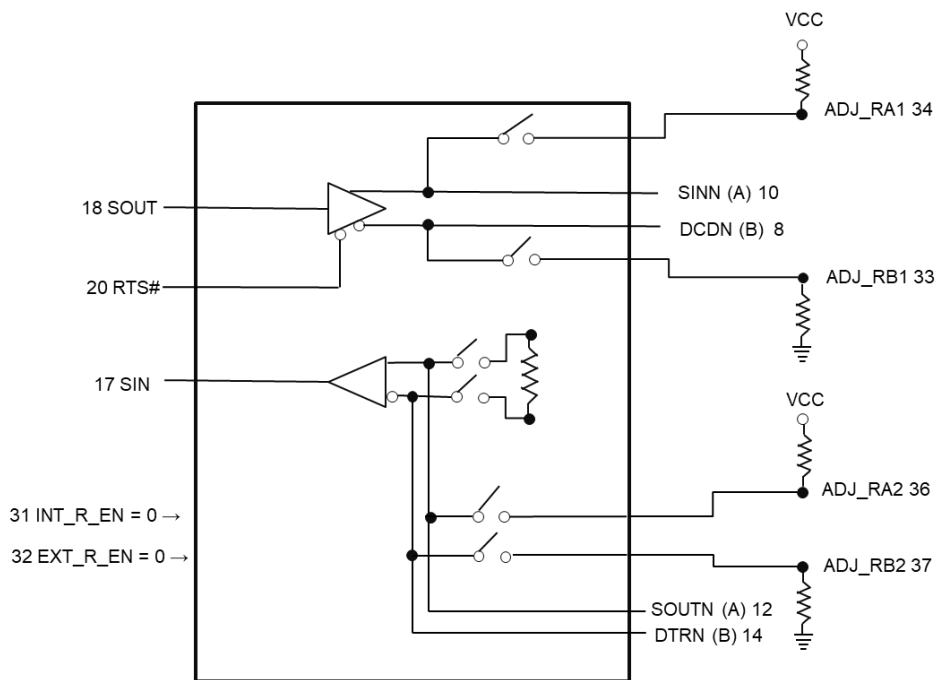


Figure 5. RS-422 without Resistors

Set pin 31 (INT_R_EN) high and Pin 32 (EXT_R_EN) high, the RS-422 full duplex has enabled switch for internal and external resistors, as below Figure 6.

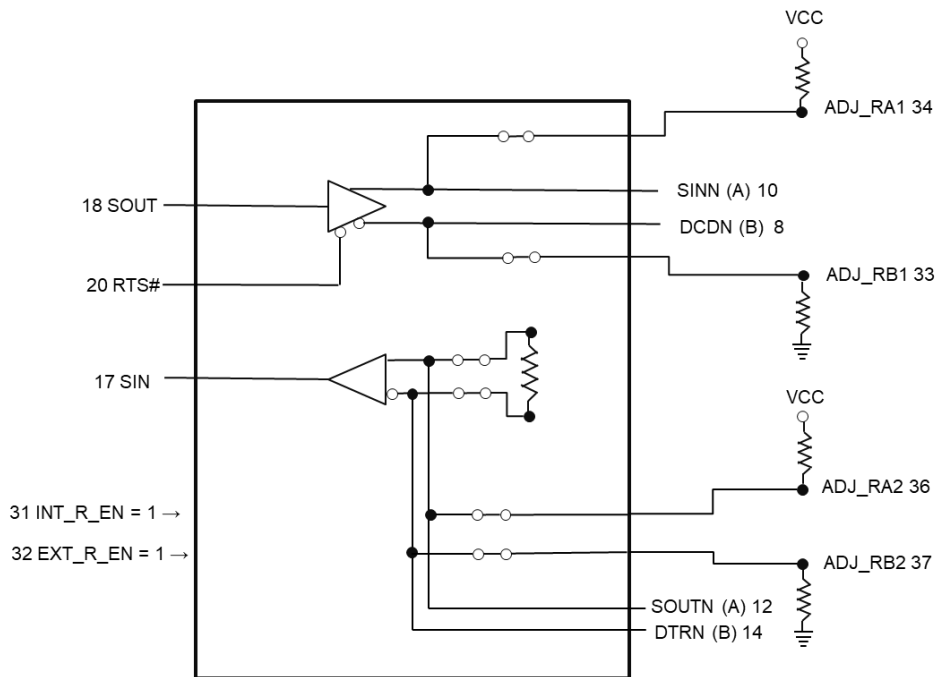


Figure 6. RS-422 with Internal and External Resistors

Table 6. Transmitting and Receiving States

Transmitting					
Input			Output		
Pin 26 SD#	Pin 20 RTS#	Pin 18 SOUT	ACTION	Pin 10 SINN	Pin 8 DCDN
H	0	0	Turn Driver ON	0	1
H	0	1	Turn Driver ON	1	0
H	1	1	Turn Driver OFF	High impedance	High impedance
L	X	X	Turn Driver OFF	High impedance	High impedance
Receiving					
Input			Output		
Pin 26 SD#	A-B		Pin 17 SIN		
H	$\geq +200\text{mV}$		1		
H	$\leq -200\text{mV}$		0		
L	X		1		

5.3.3. RS-422 Full Duplex (Mode 111)

This mode is TX enable low active mode with auto sensing (or auto direction control) by SOUT pin. Below Figure 7 and Figure 8 demonstrate only for RS-422 without resistors and enable switch for internal and external resistors as per Table 2. In addition, transmitting and receiving states of RS-422 (mode 111) described in Table 7.

Set pin 31 (INT_R_EN) low and pin 32 (EXT_R_EN) low, the RS-422 full duplex transceiver has no resistors, as below Figure 7.

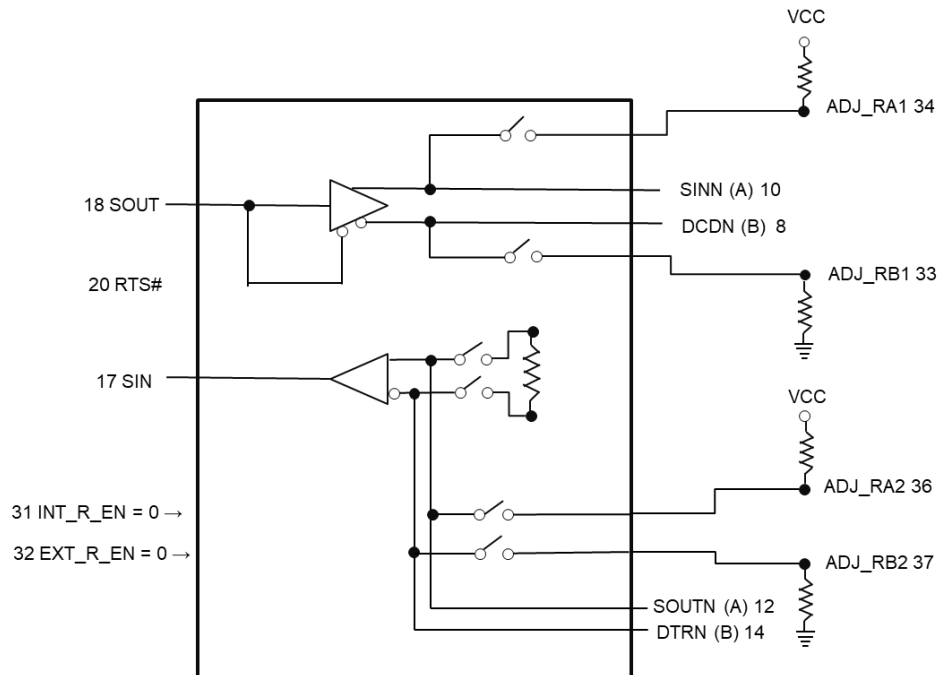


Figure 7. RS-422 with Auto Sensing has No Resistors

Set pin 31 (INT_R_EN) high and pin 32 (EXT_R_EN) high, the RS-422 full duplex transceiver has enabled switch for internal and external resistors, as below Figure 8.

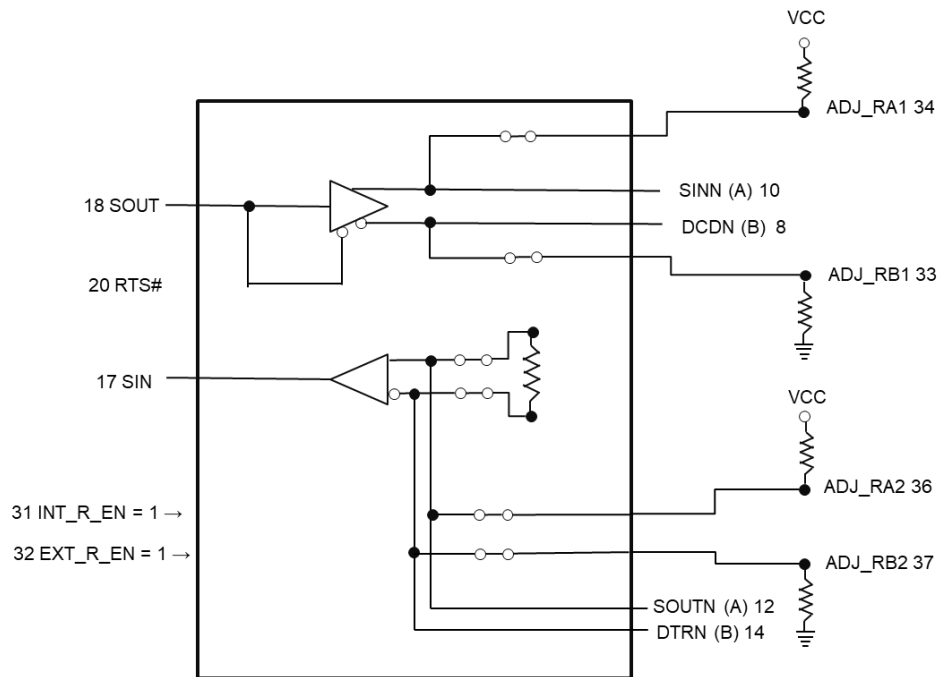


Figure 8. RS-422 with Auto Sensing, Internal and External Resistors

Table 7. Transmitting and Receiving States

Transmitting				
Input			Output	
Pin26 SD#	Pin18 SOUT	ACTION	Pin10 SINN	Pin8 DCDN
1	L	Turn Driver ON	L	H
1	H	Turn Driver OFF	High Impedance	High Impedance
0	X	Turn Driver OFF	High Impedance	High Impedance
Receiving				
Input			Output	
Pin 26 SD#	A-B		Pin 17 SIN	
H	$\geq +200\text{mV}$		1	
H	$\leq -200\text{mV}$		0	
L	X		1	

5.3.4. RS-485 Half Duplex (Mode 010)

This mode is TX enable high active mode. Below Figure 9 and Figure 10 demonstrate only for RS-485 without resistors and enable switch for internal and external resistors. In addition, transmitting and receiving states of RS-485 (mode 010) described in Table 8.

Set pin 31 (INT_R_EN) low and pin 32 (EXT_R_EN) low, the RS-485 half duplex transceiver has no resistors, as below Figure 9.

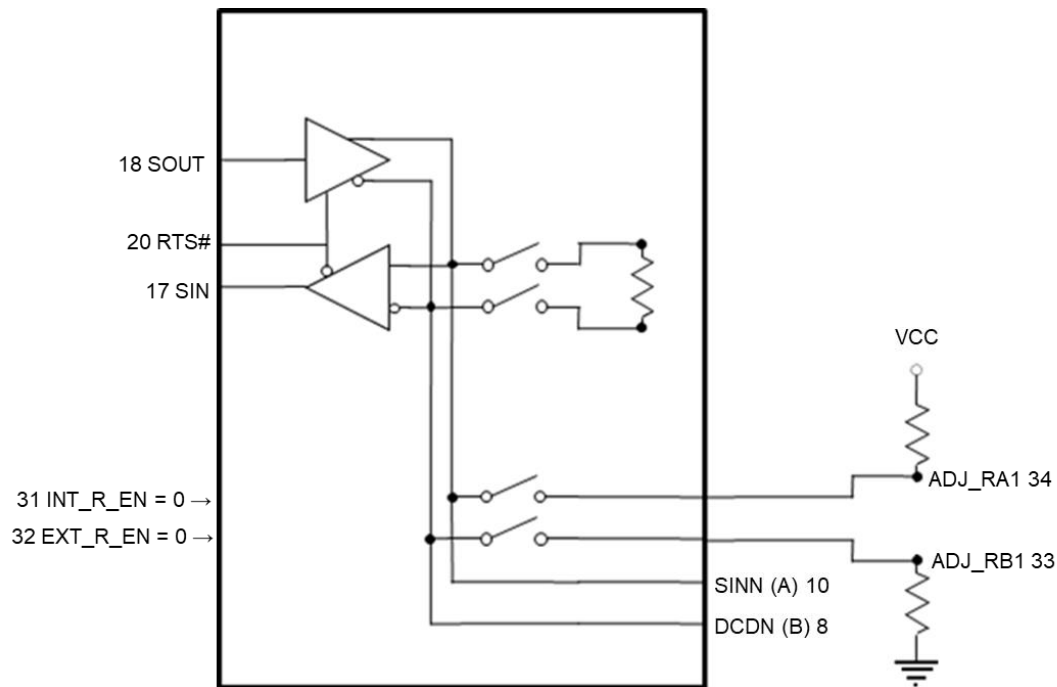


Figure 9. RS-485 without Resistors

Set pin 31 (INT_R_EN) high and pin 32 (EXT_R_EN) high, the RS-485 half duplex transceiver has the enable switch for internal and external resistors, as below Figure 10.

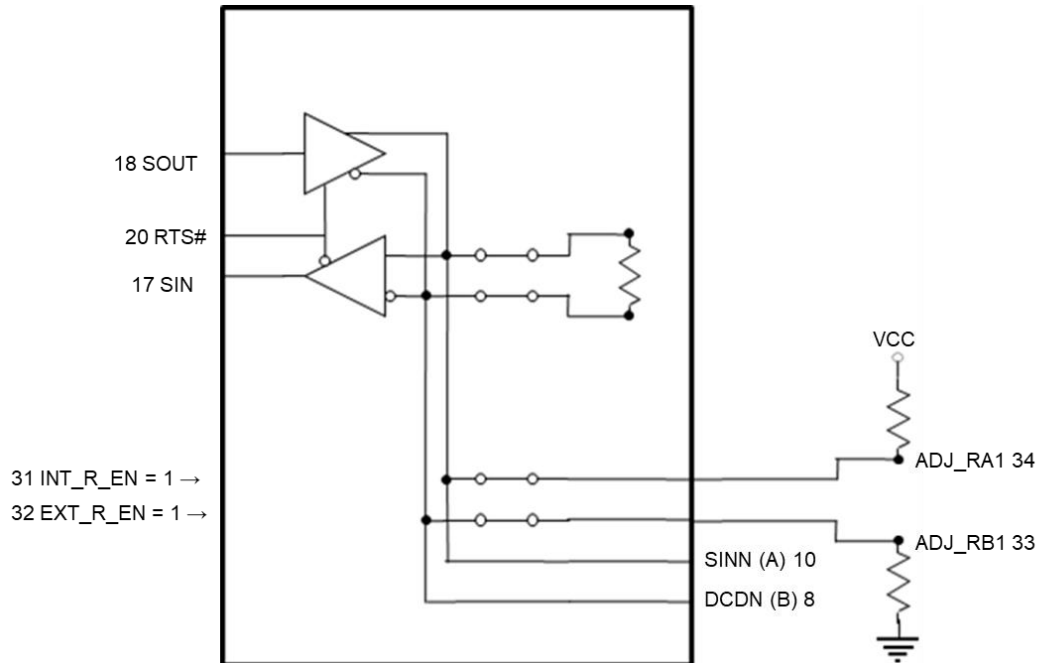


Figure 10. RS-485 with Internal and External Resistors

Table 8. Transmitting and Receiving States

Transmitting						
Input				Output		
Pin 26 SD#	Pin 20 RTS#	Pin 18 SOUT	ACTION	Pin 10 SINN	Pin 8 DCDN	
1	1	0	Turn Driver ON	L	H	
1	1	1	Turn Driver ON	H	L	
1	0	1	Turn Driver OFF	High Impedance	High Impedance	
0	X	X	Turn Driver OFF	High Impedance	High Impedance	
Receiving						
Input					Output	
Pin 26 SD#	Pin 20 RTS#	Pin 18 SOUT	A-B	DRIVER STATE	RECEIVER STATE	Pin 17 SIN
H	0	1	$\geq +200\text{mV}$	OFF	ON	1
H	0	1	$\leq -200\text{mV}$	OFF	ON	0
H	1	0	X	ON	OFF	1
H	1	0	$\geq +200\text{mV}$	ON	OFF	1
H	1	0	$\leq -200\text{mV}$	ON	OFF	1
L	X	X	X	OFF	OFF	1

5.3.5. RS-485 Half Duplex (Mode 110)

This mode is TX enable low active. Below Figure 11 and Figure 12 demonstrate only for RS-485 without resistors and enable switch for internal and external resistors. In addition, transmitting and receiving states of RS-485 (mode 110) described in Table 9.

Set pin 31 (INT_R_EN) low and pin 32 (EXT_R_EN) low, the RS-485 half duplex transceiver has no resistors, as below Figure 11.

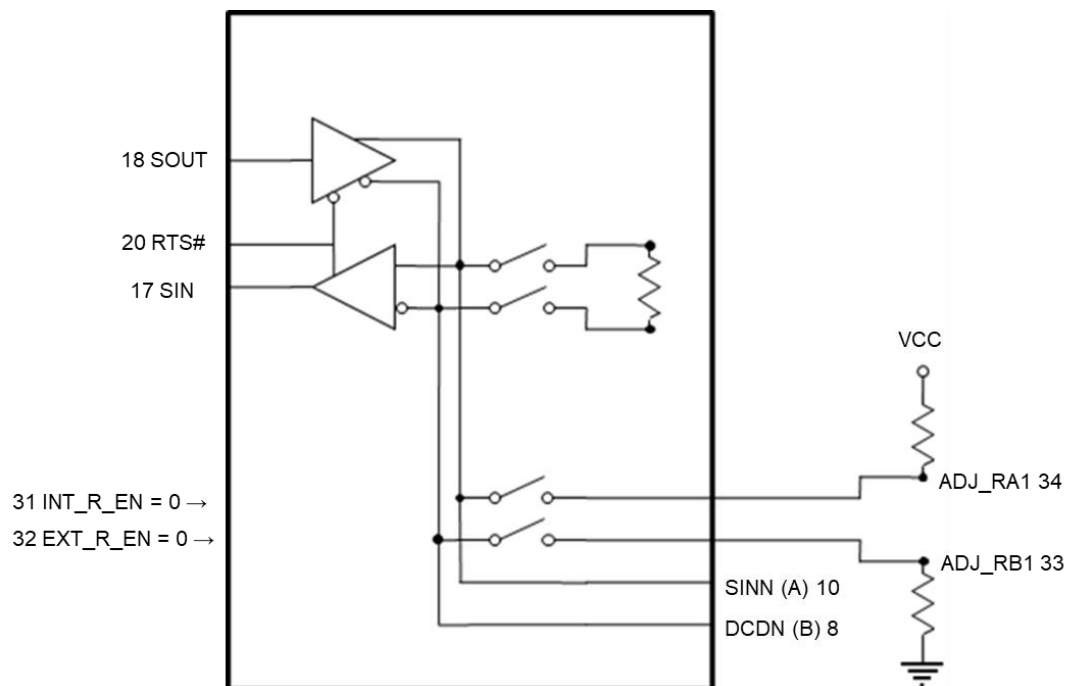


Figure 11. RS-485 without Resistors

Set pin 31 (INT_R_EN) high and pin 32 (EXT_R_EN) high, the RS-485 half duplex transceiver has the enable switch for internal and external resistors, as below Figure 12.

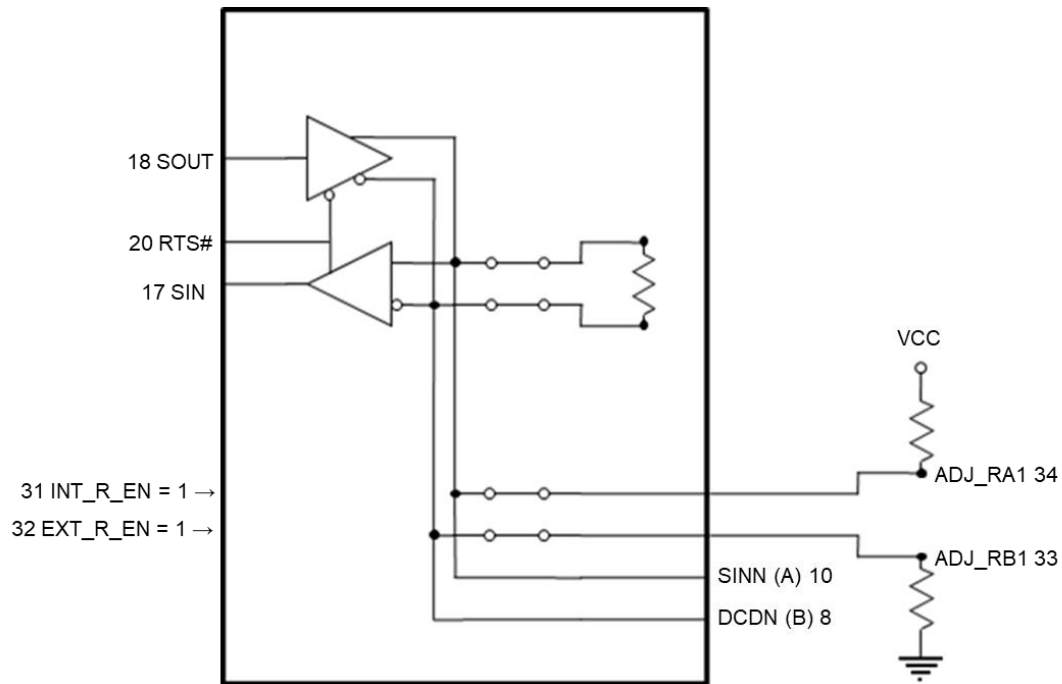


Figure 12. RS-485 with Internal and External Resistors

Table 9. Transmitting and Receiving states

Transmitting					
Input			Output		
Pin 26 SD#	Pin 18 SOUT	ACTION	Pin10 SINN	Pin 8 DCDN	Pin 26 SD#
1	0	0	Turn Driver ON	L	H
1	0	1	Turn Driver ON	H	L
1	1	X	Turn Driver OFF	High Impedance	High Impedance
0	X	X	Turn Driver OFF	High Impedance	High Impedance
Receiving					
Input				Output	
Pin 26 SD#	Pin 18 SOUT	A-B	Driver State	Receiver state	Pin 17 SIN
H	1	$\geq +200\text{mV}$	OFF	ON	1
H	1	$\leq -200\text{mV}$	OFF	ON	0
H	0	X	ON	OFF	1
H	0	$\geq +200\text{mV}$	ON	OFF	1
H	0	$\leq -200\text{mV}$	ON	OFF	1
L	X	X	X	X	1

5.3.6. RS-485 Half Duplex (Mode 101)

This mode is TX enable low active with auto sensing (or auto direction control) by SOUT (pin 18). Below Figure 13 and Figure 14 demonstrate only for RS-485 without resistors and enable switch for internal and external resistors. In addition, transmitting and receiving states of RS-485 (mode 101) described in Table 10.

Set pin 31 (INT_R_EN) low and pin 32 (EXT_R_EN) low, the RS-485 half duplex with auto sensing transceiver has no resistors, as below Figure 13.

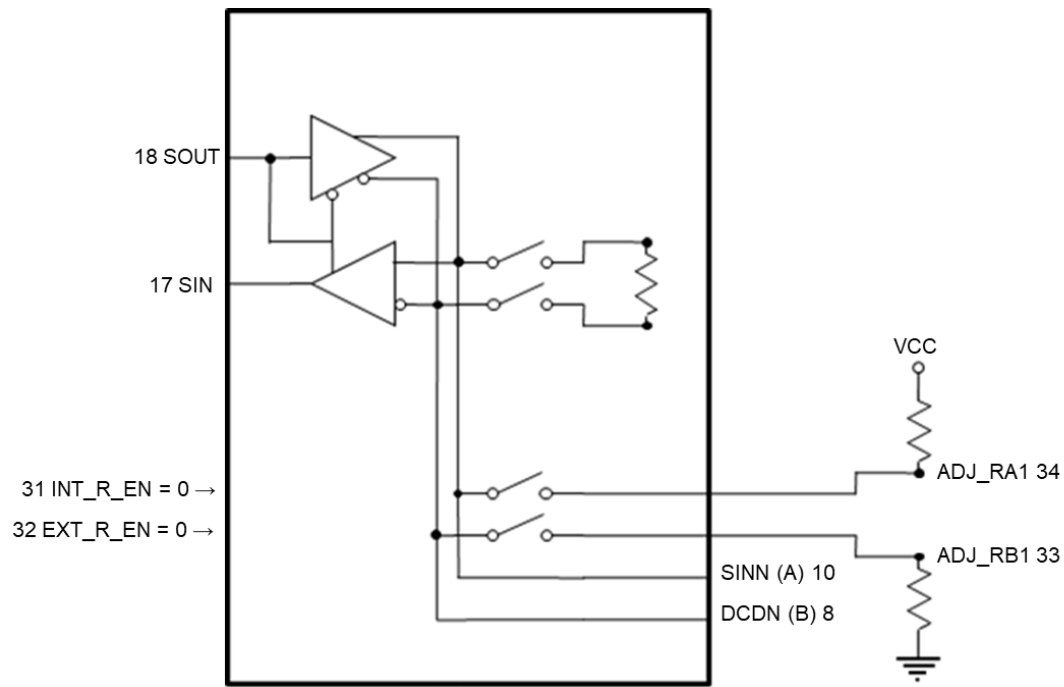


Figure 13. RS-485 with Auto Sensing has No Resistors

Set pin 31 (INT_R_EN) high and pin 32 (EXT_R_EN) high, the RS-485 half duplex with auto sensing transceiver has the enable switch for internal and external resistors, as below Figure 14.

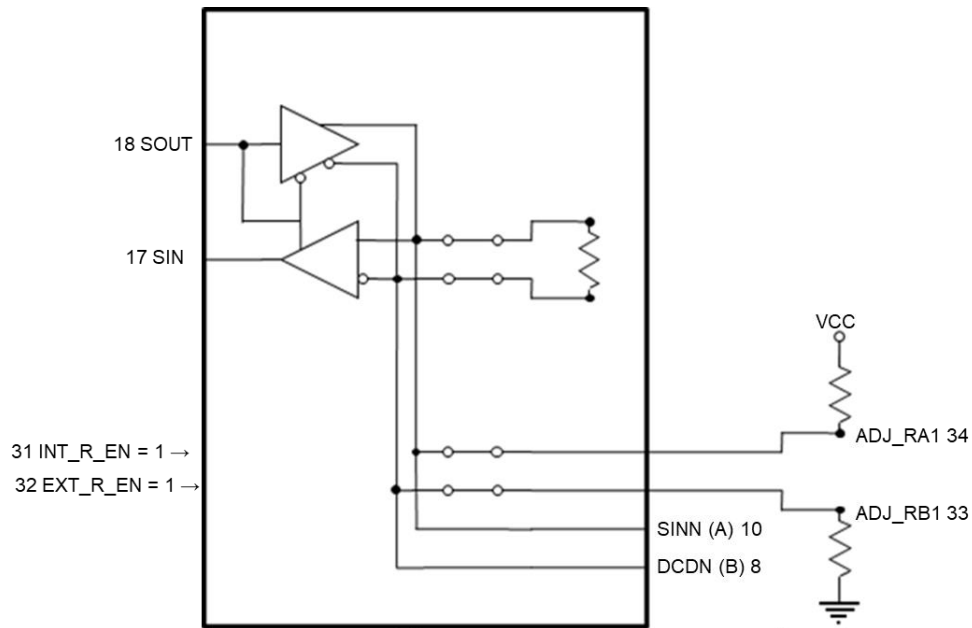


Figure 14. RS-485 with Auto Sensing, Internal and External Resistors

Table 10 Transmitting and Receiving States

Transmitting					
Input			Output		
Pin 26 SD#	Pin 18 SOUT	ACTION	Pin10 SINN	Pin 8 DCDN	
1	L	Turn Driver ON	L	H	
1	H	Turn Driver OFF	High Impedance	High Impedance	
0	X	Turn Driver OFF	High Impedance	High Impedance	
Receiving					
Input					Output
Pin 26 SD#	Pin 18 SOUT	A-B	Driver State	Receiver state	Pin 17 SIN
1	1	$\geq +200\text{mV}$	OFF	ON	1
1	1	$\leq -200\text{mV}$	OFF	ON	0
1	0	X	ON	OFF	1
1	0	$\geq +200\text{mV}$	ON	OFF	1
1	0	$\leq -200\text{mV}$	ON	OFF	1
0	X	X	X	X	1

5.4. Failsafe

The F81435 guarantees a logic-high receiver output when the receiver inputs are floating, shorted or open. This is done by setting the receiver threshold between -100mV and -250mV. If the differential receiver input voltage (A - B) is greater than or equal to -100mV, receiver output is logic high. If A - B is less than or equal to -250mV, RO is logic low. With the receiver thresholds of the F81435, this results in a logic high with a 100mV minimum noise margin. The -100mV to -250mV threshold complies with the $\pm 200\text{mV}$ EIA/TIA-485 standard.

6 Electrical Characteristics

6.1 Absolute Maximum Ratings

Parameter	Rating
Power Supply Voltage (VCC)	-0.3 to 6.0V
Receiver Input Voltage (DC input Voltage)	-16.5 to +16.5 V
Driver Output Voltage (from Ground)	-13.2 to +13.2V
Storage Temperature	-65 to +150°C
Lead Temperature (soldering, 10s)	+300°C
Operating Temperature*	-40 to 85°C
Short Circuit Duration, TX out to Ground	Continuous
Logic Interface Voltage VL	$VL \leq IO_PWR$
Voltage at TTL Input Pins	-0.3 to +6.0V

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

*Design Guarantee

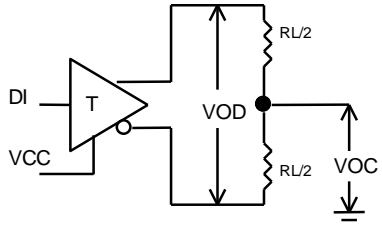
6.2 DC Characteristics

(VCC = 3.3V ± 10% or +5.0V ± 10%)

Parameter	Conditions	MIN	TYP	MAX	Unit
Supply Voltage (VCC)		3.0		5.5	V
Supply Voltage (IO_PWR)		1.62		5.5	V
Supply Current (RS-232)	No Load, VCC=5V, IO_PWR=5V, SD#=1 INT_R_EN (pin 31) =0 EXT_R_EN (pin 32) =0		5		mA
Supply Current (RS-485)	No Load, VCC=5V, IO_PWR=5V, SD#=1 INT_R_EN (pin 31) =0 EXT_R_EN (pin 32) =0		5		mA
Supply Current (RS-422)	No Load, VCC=5V, IO_PWR=5V, SD#=1 INT_R_EN (pin 31) =0 EXT_R_EN (pin 32) =0		5		mA
Supply Current (Shutdown mode)	No Load, VCC=5V, IO_PWR=5V, SD#=0		20		µA

(T_A = 0° C to 70° C, VCC = 5.0V ± 10%, IO_PWR default is 5.0V but conditions block value is the principle value)

Transmitter and Logic Input Pins: EN, DRIVING, MODE, SD, SLEW: pin 18, 20, 21, 26, 27, 28, 29, 30, 31, 32						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Logic Input Voltage Low	VIL			0.4	V	IO_PWR = 1.8V
Logic Input Voltage High	VIH	1.2			V	
Logic Input Voltage Low	VIL			0.8	V	IO_PWR = 3.3V
Logic Input Voltage High	VIH	2			V	
Logic Input Voltage Low	VIL			0.8	V	IO_PWR = 5V
Logic Input Voltage High	VIH	2.4			V	
Logic Input Pull-up Current				1.5	μA	IO_PWR = 1.8V
Logic Input Pull-up Current				7.5	μA	IO_PWR = 3.3V
Logic Input Pull-up Current				20	μA	IO_PWR = 5V
Logic input leakage current high				1	μA	Input High (VIN=IO_PWR)
Logic Input Hysteresis	V _{HYS}		0.5		V	IO_PWR=1.8V/3.3V/5V
RS-232 and RS-485 / 422 Receiver Outputs: pin 17, 19, 22, 23, 24						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Receiver Output Voltage HIGH	V _{OH}	1.5	1.7		V	Receiver output current = -1mA, IO_PWR = 1.8V
Receiver Output Voltage HIGH	V _{OH}	3	3.2		V	Receiver output current = -1mA, IO_PWR = 3.3V
Receiver Output Voltage HIGH	V _{OH}	4.7	4.9		V	Receiver output current = -1mA, IO_PWR = 5V
Receiver Output Voltage LOW	V _{OL}		0.1	0.4	V	Receiver output current = 1.6mA,
Receiver Output Short Circuit Current	T _{OUT} shorted to GND		±20	±60	mA	0 ≤ V _o ≤ IO_PWR.
Receiver Output Leakage Current			±0.05	±10	μA	0 ≤ V _o ≤ IO_PWR Receivers Disabled.

RS-232 Single-End Receiver Inputs: pin 8, 9, 10, 13, 15						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Input Voltage	V_{IN}	-16.5		16.5	V	
Input Threshold Low	$V_{IN} (H-L)$	0.8	1.5		V	$V_{CC} = 5V$, Active
Input Threshold HIGH	$V_{IN} (L-H)$		1.8	2.4	V	$V_{CC} = 5V$, Active
Input Hysteresis	V_{HYS}		0.5		V	
Input Resistance	R_{IN}	3	5	7	k Ω	
RS-485 / RS-422 Differential Receiver Inputs: pin 8, 10, 12, 14						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Input Resistance	R_{IN}	25			K Ω	$-7V \leq V_{CM} \leq +12V$
Receiver Differential Threshold Voltage	V_{TH}	-250	-200		mV	$V_B = 0V$.
Receiver Input Hysteresis	ΔV_{TH}		30		mV	$V_{CM} = 0V$.
Receiver Input Current	I_{IN}		200	300	μA	$V_{in} = 12V$, Full-Duplex.
Receiver Input Current			-200	-300	μA	$V_{in} = -7V$, Full-Duplex.
Termination Resistance	R_{TERM}		120		Ω	$-7V \leq V_{CM} \leq +12V$
Terminator switching resistor (ADJ_RA1, ADJ_RA2, ADJ_RB1, ADJ_RV2)	R_{switch}		60		Ω	
RS232 Single-Ended Driver Outputs: pin 11, 12, 14						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Output Voltage Swing	V_o		± 9		V	Output Loaded with 3k Ω to GND, $V_{CC} = 5V$
				± 10.0	V	No Load Output, $V_{CC} = 5V$
			± 5		V	Output Loaded with 3k Ω to GND, $V_{CC} = 3.3V$
				± 6.6	V	No Load Output, $V_{CC} = 3.3V$
Output Short Circuit Current	I_{sc}			± 60	mA	$V_o = 0V$.
Power Off Impedance	R_{OFF}	300	10M		Ω	$V_{CC} = V_+ = V_- = 0V$, $V_o = \pm 2V$.
						

RS-422/485 Differential Driver Outputs: pin 8, 10						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Differential Driver Output	V _{OD}	2		VCC	V	R _{LOAD} = 100Ω (RS422) VCC=5.0V
		1.5		VCC		R _{LOAD} = 100Ω (RS422) VCC=3.3V
		1.5		VCC		R _{LOAD} = 54Ω (RS485)
		1.0		VCC		R _{LOAD} = 54Ω (RS485) VCC=3.3V
		1.5		VCC		V _{CM} = -7V, VCC=5.0V
		1.0		VCC		V _{CM} = -7V, VCC=3.3V
		1.5		VCC		V _{CM} = 12V, VCC=5.0V
		1.0		VCC		V _{CM} = 12V, VCC=3.3V
Change in Magnitude of Differential Output Voltage	Δ V _{OD}	-0.2		0.2	V	R _{LOAD} = 54Ω or 100Ω
Driver Common Mode Output Voltage	V _{CM}			3	V	R _{LOAD} = 54Ω or 100Ω
Change in Magnitude of Common Mode Output Voltage	Δ V _{CM}			0.2	V	R _{LOAD} = 54Ω or 100Ω
Driver Output Short Circuit Current	I _{OSD}			±250	mA	V = +12V to -7V
Output Leakage Current	I _o		±200	±300	μA	DE = 0V or Shutdown, VO = +12V to -7V.

6.3 AC Characteristics

($T_A = 0^\circ\text{C}$ to 70°C , $V_{CC} = 5.0\text{V} \pm 10\%$, IO_PWR default is 5.0V but conditions block value is the principle value)

All Modes						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Enable from shutdown	t_{ENABLE}		1000		μs	
Enable to shutdown	$T_{SHUTDOWN}$		10		μs	
RS-232 (SLEW = GND, Data rate = 250Kbps, One Driver Switching)						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Maximum Data Rate		250			kbps	$R_L=3\text{K}$, $C_L=1000\text{pF}$
Receiver Propagation Delay	t_{RHL} , t_{RLH}		100		ns	$C_L=150\text{pF}$
Receiver Propagation Delay Skew	$ t_{RHL} - t_{RLH} $		50		ns	$C_L=150\text{pF}$
Driver Propagation Delay Skew	$ t_{DHL} - t_{DLH} $		100		ns	
Transition-Region Slew Rate $\pm 3.0\text{V}$	t_{SHL} , t_{SLH}	5		30	$\text{V}/\mu\text{s}$	$V_{CC}=3.3\text{V}$, $R_L=3\sim 7\text{K}\Omega$, $C_L=1000\text{pF}$
RS-232 (SLEW = Vcc, Data rate = 3Mbps, One Driver Switching)						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Maximum Data Rate		3			Mbps	$R_L=3\text{K}$, $C_L=100\text{pF}$
Receiver Propagation Delay	t_{RHL} , t_{RLH}		100		ns	$C_L=100\text{pF}$
Receiver Propagation Delay Skew	$ t_{RHL} - t_{RLH} $		50		ns	$C_L=100\text{pF}$
Driver Propagation Delay Skew	$ t_{DHL} - t_{DLH} $		25		ns	
Transition-Region Slew Rate $\pm 3.0\text{V}$	t_{SHL} , t_{SLH}		90		$\text{V}/\mu\text{s}$	$V_{CC}=5\text{V}$, $R_L=3\sim 7\text{K}\Omega$, $C_L=100\text{pF}$
RS-485/RS-422 (SLEW = GND, 250kbps, One Driver Switching)						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Maximum Data Rate		250			kbps	$R_{DIFF}=54\Omega$, $C_L=47\text{pF}$
Driver Propagation Delay	t_{DPHL} , t_{DPLH}	250		1500	ns	
Driver Rise and Fall Time	t_R , t_F	200		1500	ns	
Driver Propagation Delay Skew	t_{SKEW}			200	ns	
Driver Output Enable Time	t_{RZH} , t_{RZL}			300	ns	only RS485
Driver Output Disable Time	t_{RHZ} , t_{RLZ}			300	ns	only RS485
Receiver Propagation Delay	t_{DPHL} , t_{DPLH}			150	ns	
Receiver Enable to Output High	t_{ZH}		50		ns	only RS485
Receiver Enable to Output Low	t_{ZL}		50		ns	only RS485
Receiver Output High to Disable	t_{HZ}		50		ns	only RS485

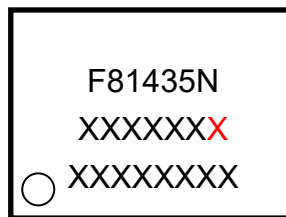
Receiver Output Low to Disable	t_{LZ}		50		ns	only RS485
RS-485/RS-422 (SLEW = Vcc, 20Mbps, One Driver Switching)						
Parameter	SYM	MIN	TYP	MAX	Unit	Conditions
Maximum Data Rate		20			Mbps	$R_{DIFF}=54\Omega$, $C_L=47pF$
Driver Propagation Delay	t_{DPHL}, t_{DPLH}		60	120	ns	
Driver Rise and Fall Time	t_R, t_F		10	25	ns	
Driver Propagation Delay Skew	t_{SKEW}			10	ns	
Driver Output Enable Time	t_{RZH}, t_{RZL}			300	ns	only RS485
Driver Output Disable Time	t_{RHZ}, t_{RLZ}			300	ns	only RS485
Receiver Propagation Delay	t_{RPHL}, t_{RPLH}			150	ns	
Receiver Enable to Output High	t_{ZH}		32		ns	only RS485
Receiver Enable to Output Low	t_{ZL}		32		ns	only RS485
Receiver Output High to Disable	t_{HZ}		40		ns	only RS485
Receiver Output Low to Disable	t_{LZ}		40		ns	only RS485

7 Ordering Information

Part Number	Package Type	MSL Classification
F81435N	40 pin QFN (5mm x 5mm)	3

8 Top Marking Specification

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



1st Line: Device Name → **F81435N**, where N means QFN package

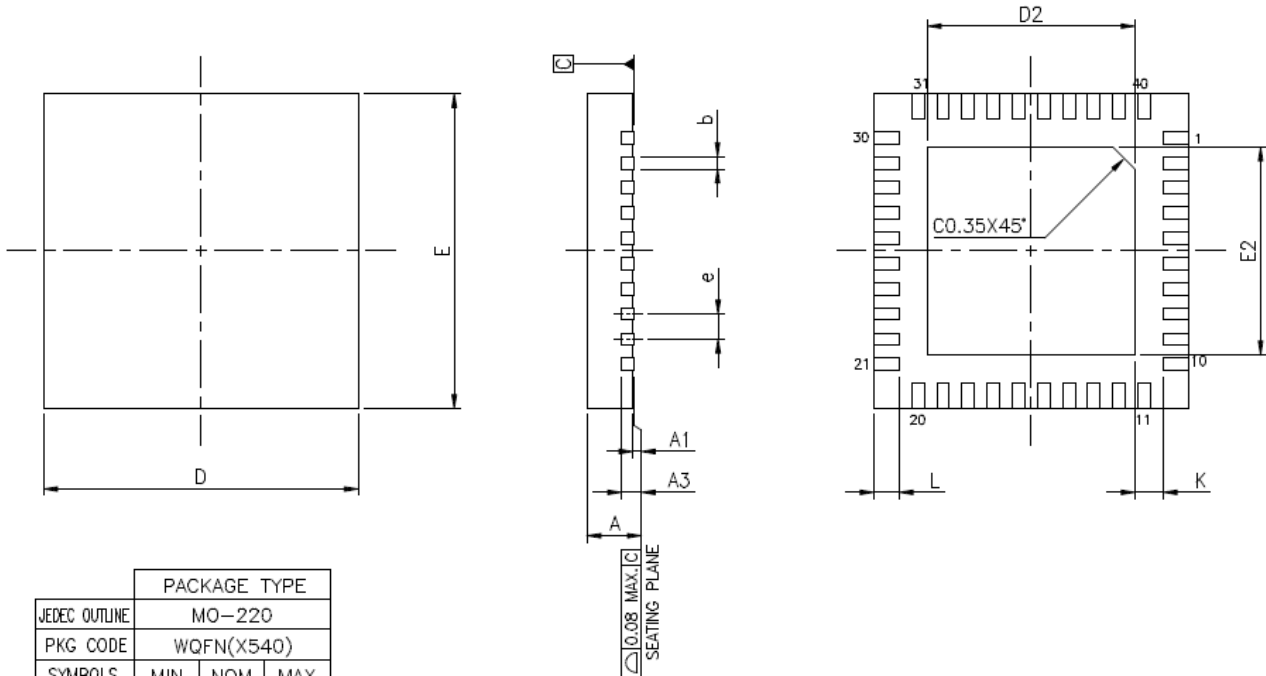
2nd Line: Assembly Plant Code (X) + Assembled Year Code (X) + Week Code (XX) + Fintek Internal Code (XX) + IC Version (**X**) where "A" means A version, "B" means B version ... etc

3rd Line: Wafer Lot Number (XXXX...XX)

○: Pin 1 Identifier

9 Package Dimension

40 pin QFN (5mm x 5mm)



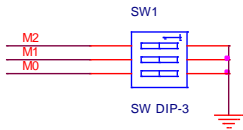
PACKAGE TYPE			
JEDEC OUTLINE	MO-220		
PKG CODE	WQFN(X540)		
SYMBOLS	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3	0.20 REF.		
b	0.15	0.20	0.25
D	5.00 BSC		
E	5.00 BSC		
e	0.40 BSC		
K	0.20	—	—

PAD SIZE	E2			D2			L		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
153X153 MIL	3.20	3.30	3.35	3.20	3.30	3.35	0.35	0.40	0.45

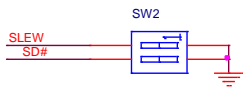
NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSION *b* APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15mm AND 0.30mm FROM THE TERMINAL TIP. IF THE TERMINAL HAS THE OPTIONAL RADIUS ON THE OTHER END OF THE TERMINAL, THE DIMENSION *b* SHOULD NOT BE MEASURED IN THAT RADIUS AREA.
3. BILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

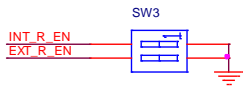
10 Application Circuit



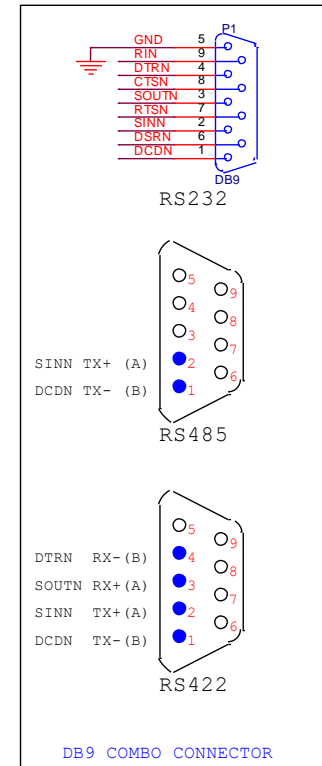
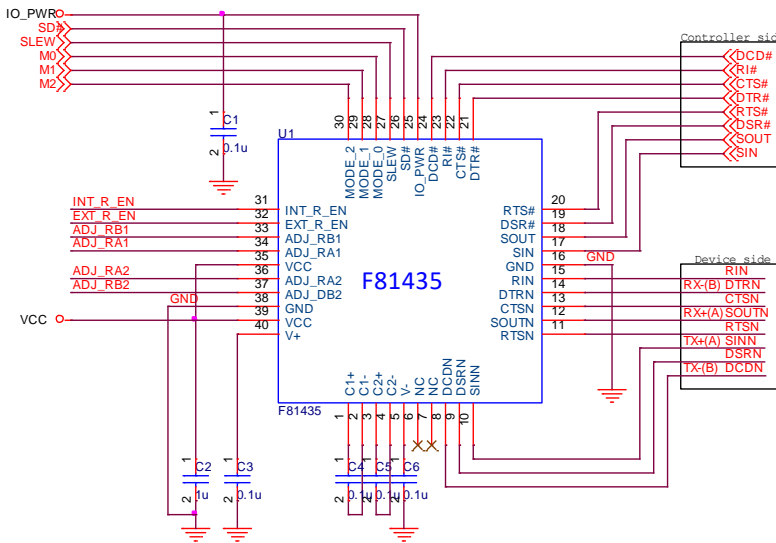
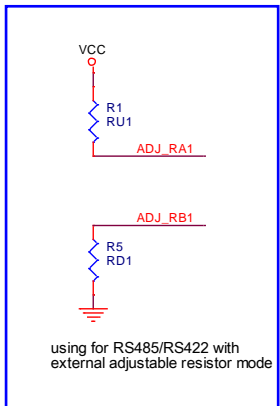
M0	M1	M2	Mode
0	0	0	1T/1R RS-422 full duplex. TX enable high active.
0	0	1	3T/5R RS-232
0	1	0	1T/1R RS-485 half duplex. TX enable high active.
0	1	1	CC Talk with S1NN as open drain output.
1	0	0	1T/1R RS-422 full duplex. TX enable low active.
1	0	1	1T/1R RS-485 half duplex. TX enable low active with auto sensing.
1	1	0	1T/1R RS-485 half duplex. TX enable low active.
1	1	1	1T/1R RS-422 full duplex. TX enable low active with auto sensing.



SD	Mode
0	shutdown mode
1	normal mode



INT_R_EN	EXT_R_EN	Mode
0	0	No resistor.
0	1	Enable switch for external adjustable resistors.
1	0	Enable switch for internal resistors.
1	1	Enable switches for internal and external resistors.



Title Feature Integration Technology Inc.		
Size B	Document Number F81435 Application Circuit	Rev 1.5
Date:	Monday, September 21, 2020	Sheet 1 of 1