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# CYF4455B Datasheet

## 300MHz to 450MHz Transmitter

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### 1. GENERAL DESCRIPTION:

CYF4455B is a high-performance, easy-to-use single-chip ASK transmitter IC, suitable for long-range wireless applications in the 300-450MHz frequency band. This chip is a monolithic device that can truly achieve "data input, antenna output". CYF4455B has three powerful attributes: power output, working voltage and working temperature. CYF4455B can provide +14dBm for 50Ω load. This power level allows small transmitters (lossy antennas), such as key fob transmitters, to operate near the maximum limits of the transmission rules. 2.0V to 3.6V operating voltage, CYF4455B can be used with most batteries, reaching the limit of its use range. The operating temperature range is -20°C to +70°C.

CYF4455B is easy to use. It only requires some additional external components and a crystal to generate a reference frequency (RF carrier frequency divided by 32 times), which is enough to create a complete multi-function transmitter.

CYF4455B adopts ASK / OOK (Amplitude Shift Keying/On-Off Keying) UHF receiver type, ranging from broadband super-regenerative radios to narrow-band high-performance super-heterodyne receivers. The maximum ASK data rate of is 10kbps (Manchester encoding).

CYF4455B transmitter solution is very suitable for simple and important industrial and consumer applications.

CYF4455B has a power management function. This function can activate the transmitter as long as it receives a high transient data input trigger signal. If there is no data input transient for more than about 75ms, the transmitter will automatically shut down.

## 2. FEATURES:

- Complete UHF transmitter;
- 300MHz to 450MHz frequency range;
- ASK modulation data rate up to 10kbps;
- Output power reaches +14dBm;
- Few external parts needed;
- Low voltage operation (down to 2.0V);
- Use crystal or ceramic resonator;
- Power-down mode and wake-up function to reduce power consumption
- Packaging: SOT23-6

## 3. APPLICATIONS:

- Fan controller
- Remote power switch
- Multimedia remote control
- Remote sensor data link
- Infrared transmitter replacement

## 4. APPLICATION CIRCUIT:

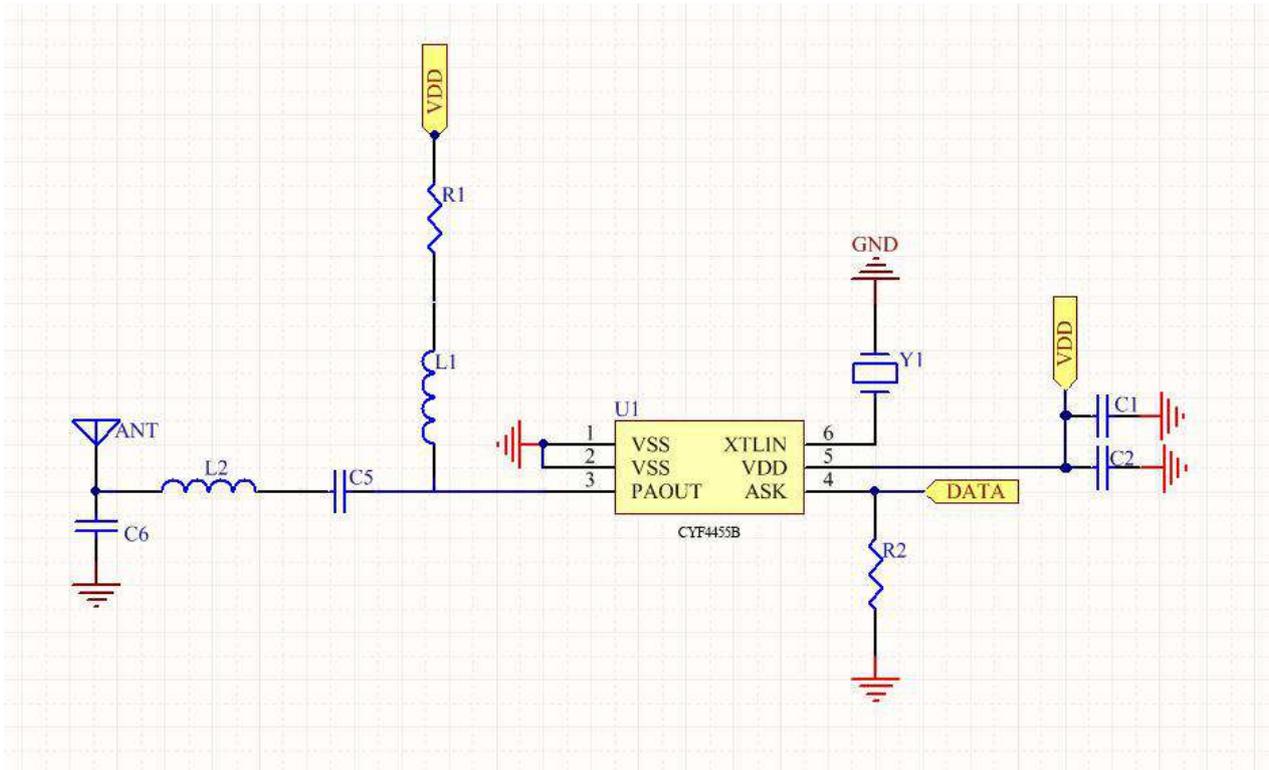


Figure 1. Typical design ASK at 315 MHz and 433.92 MHz

**APPLICATION PARAMETER**

Part	Value		Unit
	315MHz	433.92MHz	
R1	0	0	Ω
R2	100K	100K	Ω
C1	1U	1U	F
C2	100P	100P	F
C5	10P	10P	F
C6	5.6P	1.8P	F
L1	100N	100N	H
L2	56N	18N	H
Y1	9.84375	13.56	MHz
U1	CYF4455B	CYF4455B	

**CERTIFICATED CIRCUIT**

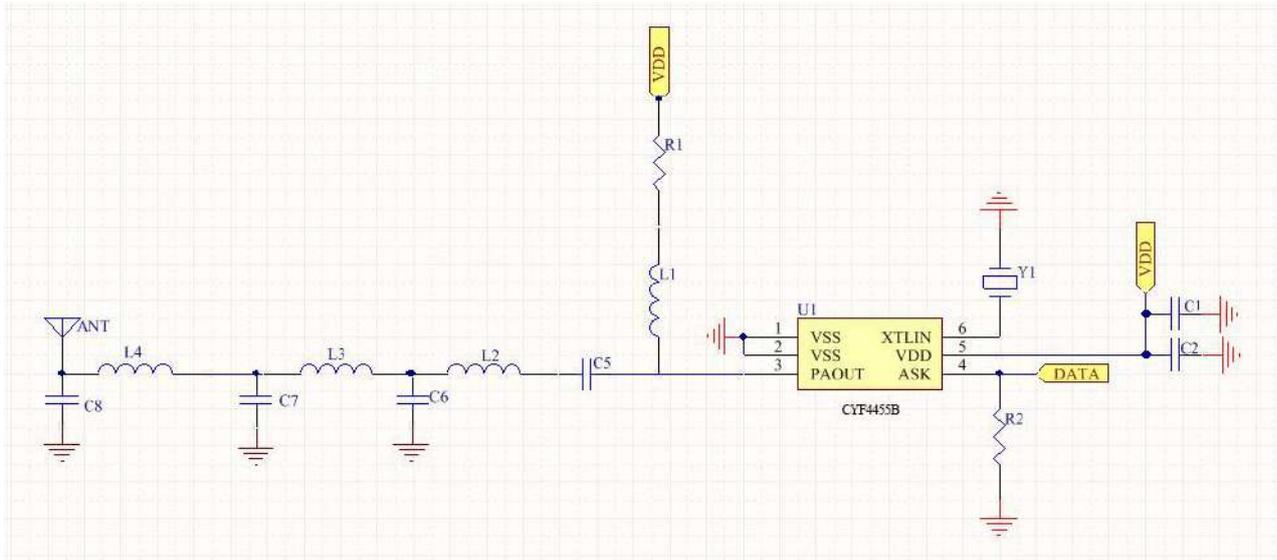
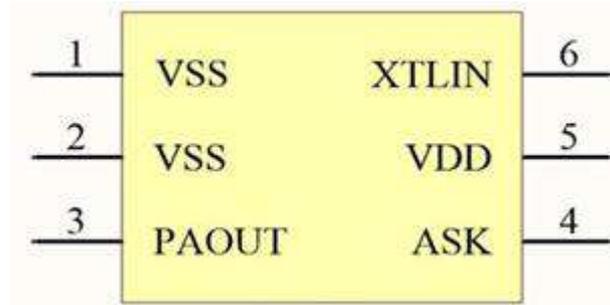


Figure 2. Certificated design ASK at 315 MHz and 433.92 MHz

**APPLICATION PARAMETER**

Part	Value		Unit
	315MHz	433.92MHz	
R1	220	220	Ω
R2	100K	100K	Ω
C1	1U	1U	F
C2	100P	100P	F
C5	68P	68P	F
C6	18P	15P	F
C7	18P	15P	F
C8	NC	NC	
L1	180N	180N	H
L2	56N	33N	H
L3	27N	18N	H
L4	56N	56N	H
Y1	9.84375	13.56	MHz
U1	CYF4455B	CYF4455B	

## 5. PIN CONFIGURATION



## 6. PIN CONFIGURATION:

Pin Name	I/O	Description	Pin NO.
VSS	G	Ground	1
VSS	G	Ground	2
PAOUT	O	Power output	3
ASK	I	ASK data input	4
VDD	P	Power supply	5
XTIN	I	Crystal oscillator input	6

## 7. ABSOLUTE MAX. RATINGS

Power voltage(VDD)	+5V
Input/output(VI/O)	VSS - 0.3 to VDD + 0.3
PA_OUT voltage (VPA_OUT)	+7.2V
Storage temperature (TS)	-65°C to +150°C
Plumbum temperature (soldering, 10 sec.)	+300°C
ESD	2KV

## 8. OPERATING RATINGS

RF frequency range	300 to 450MHz
Power voltage (VDD)	+2.0V to +3.6V

Environment temperature (TA)	-20°C to +70°C
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## 9. ELECTRICAL CHARACTERISTICS

Condition: VDD = 3.0V, VSS = 0V, TA = +25°C, xtal=13.560mhz, 1kbps, 50% duty ratio, RL= 50ohm;

Parameters	Condition	Min.	Typ.	Max.	Unit
Power Voltage	-	2.0	3.3	3.6	V
"1" Power Current I <sub>ON</sub>	P <sub>OUT</sub> =14dBm, F <sub>RF</sub> =315MHz		13		mA
	P <sub>OUT</sub> =14dBm, F <sub>RF</sub> =433.92MHz		13		mA
Frequency		200		450	MHz
Output Power P <sub>AOUT</sub> ASK="1"	f <sub>RF</sub> = 315MHz		14		dBm
	f <sub>RF</sub> = 434MHz		14		dBm
315MHz Harmonic Output	@630MH 2nd harm		-25		dBc
	@945MHz 3rd harm		-45		dBc
433.92MHz Harmonic Output	@867.84MHz 2nd harm		-27		dBc
	@1301.76MHz 3rd harm		-51		dBc
Data Rate				10	kbps
Occupied Bandwidth	@315MHz		<700		kHz
	@433.92MHz		<1000		kHz
ASK Extinction Ratio			70		dBc
315MHz SSB phase noise	@ 100kHz from Carrier		-76		dBc/Hz
	@ 1000kHz from Carrier		-79		dBc/Hz
433.92MHz SSB phase noise	@ 100kHz from Carrier		-72		dBc/Hz
	@ 1000kHz from Carrier		-81		dBc/Hz
Digital input ASK pin	High level (V <sub>IN</sub> )	0.8×V <sub>DD</sub>			V
	Low level (V <sub>IL</sub> )			0.2×V <sub>DD</sub>	V
Digital input drain current ASK pin	High level (V <sub>IN</sub> )		0.05		μA
	Low level (V <sub>IL</sub> )		0.05		μA

## 10. FUNCTION DIAGRAM

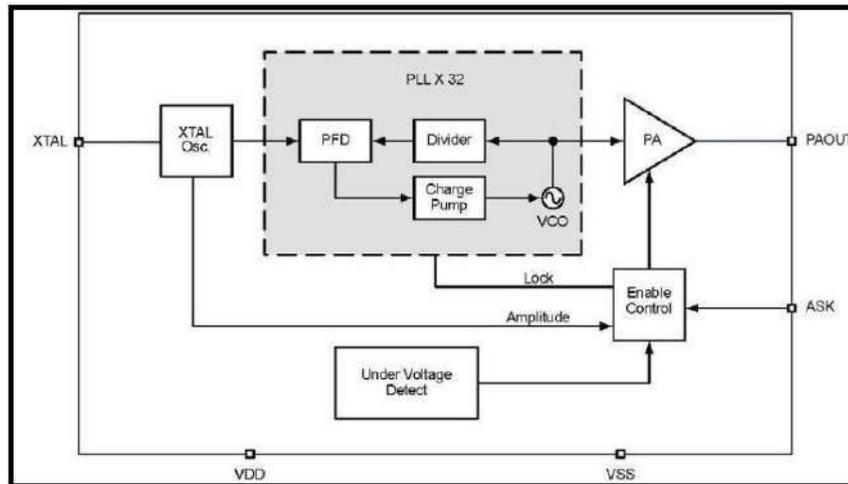


Figure 3. Functional block diagram

## 11. FUNCTION DESCRIPTION

Figure 3 is the functional block diagram. CYF4455B is best described as a phase-locked transmitter. The system is divided into five functional blocks:

- ✧ Crystal oscillator
- ✧ PLL×32
- ✧ Power amplifier
- ✧ Enable control
- ✧ Undervoltage detection

### 11.1. Crystal Oscillator

The reference oscillator uses a crystal-based Pierce configuration and is designed to receive crystals from 9.375MHz to 14.0625MHz.

### 11.2. PLL X 32

PLL×32 provides a stable carrier frequency for transmission. It is a "divide by 32" phase-locked loop oscillator.

### 11.3. Power Amplifier

The power amplifier serves two purposes:

- ✧ Buffer VCO from external components
- ✧ Amplify the phase lock signal. The power amplifier can generate +14dBm at 3V (typical value).

### 11.4. Enable Control

To start up (Enable) the gate control ASK data. It only allows transmission when lock, amplitude, and undervoltage detection conditions are valid.

### 11.5. Undervoltage Detection

The "undervoltage detection" block detects the operating voltage. If the operating voltage is lower than 2V, the "undervoltage detection" module will send a signal to the "enable control" module to disable the PA.

## 12. APPLICATION INFORMATION

### 12.1 Power Amplitude Control Using External Resistance

R1 is used to adjust the RF amplitude output level, which may be required to meet the consistency adjustment. As shown in Figure 2, R1 can adjust the radiation field allowed by FCC or ETSI compliance as needed.

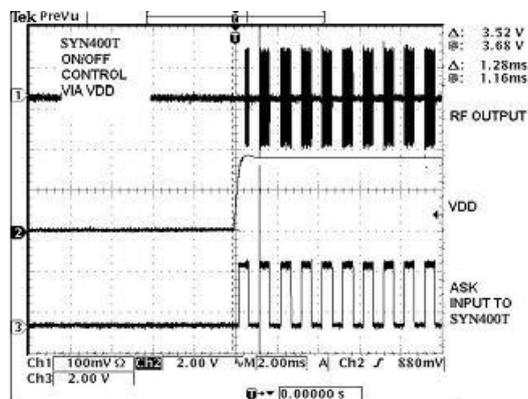


Figure 6. Rf output response (VDD and ASK)

### **12.3. Output Matching Network**

Part of the function of the output network is to attenuate the second and third harmonics. When matching the transmission frequency, care must be taken to optimize the maximum output power and reduce unnecessary harmonics.

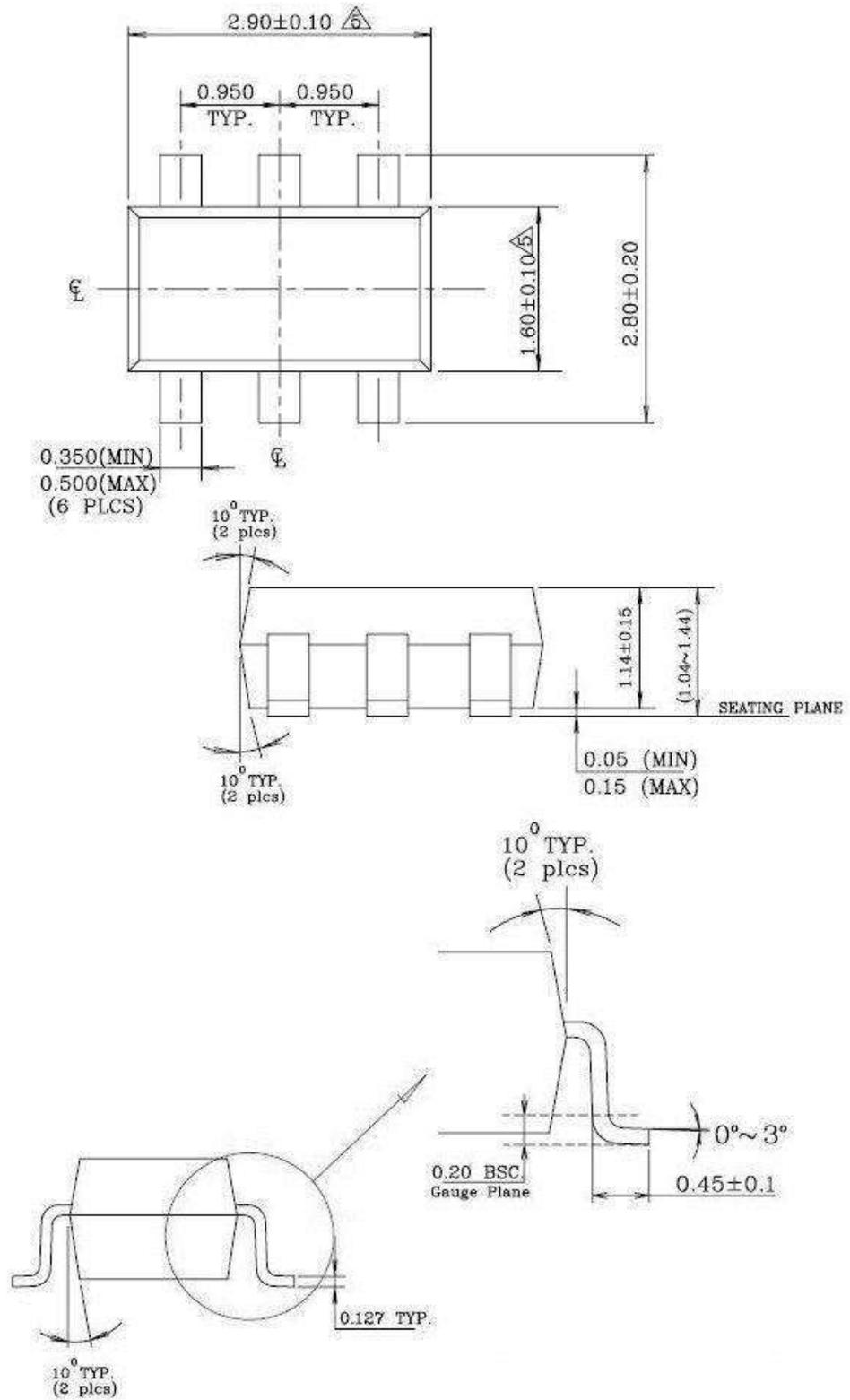
### **12.4. Layout Issues**

PCB layout is the main focus for achieving optimal performance and consistent manufacturing results. Care must be taken with the orientation of the components to ensure that they do not couple or decouple RF signals. The PCB trace length should be short to minimize parasitic inductance (1 inch  $\sim$  20nH). For example, depending on the inductance value, a 0.5 inch trace can change the inductance by as much as 10%. To reduce parasitic inductance, it is recommended to use wide traces and ground planes under signal traces. Vias with low-value inductance are used for components that need to be grounded.

### **12.5. Antenna Layout**

The directivity is affected by the antenna layout. There should be no ground plane under the antenna trace. To maintain consistent performance, components should not be placed in the loop of the antenna.

## **13. PACKAGE INFORMATION:**



For more information and assistance, please contact us as follows:

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