

Radio solutions for industrial applications worldwide



# LOW-POWER RADIO MODULES

Product Data Sheets

Competence in radio solutions

**CIRCUIT DESIGN, INC.**

# Selection guide

Model Parameter	Data Transmitter / Receiver				Data Transceiver					Radio Modem		Telecommand		Audio	Model Parameter
	CDP-TX-02E/EP CDP-RX-02E/EP	CDP-TX-02F CDP-RX-02F	CDP-TX-05M-R CDP-RX-05M-R	CDP-TX-07M/MP CDP-RX-07M/MP	STD-601 (434 MHz)	STD-601 (400 MHz)	STD-302Z	LMD-401	STD-503	SLR-434M	MU-4-434	NK-2.4Y	CDT-TX-02M-R CDT-RX-02M-R	WA-TX-03S WA-RX-03S	
<b>Interface</b>															
Serial data	●	●	●	●	●	●	●	●	●	●	●				
ON / OFF Level												●	●		
Audio														●	
<b>Protocol</b>															
Transparent	●	●	●	●	●	●	●	●	●			-	-	-	
CD original										●	●	-	-	-	
<b>Channel number</b>															
	32	128	4	4	137	137 *	Programmable	Programmable	77	137 *	127 *	-	4	15	
<b>Data rate</b> ( bps )	4,800	4,800	4,800	4,800	4,800 / 9,600	1.2 k - 19.2 k	9,600 *	4,800	19.2 k	4,800	4,800	250 k	1,200	-	
<b>Max. TX power</b> ( mW )	10 ***	10 ***	5 *	10	10 ***	50 ***	10 *	10	10	10	10 ***	1.4	10 *	10 ***	
<b>Supply voltage</b> ( V )	3.0 - 12.0	3.0 - 12.0	2.2 - 5.5 (TX) 3.0 - 14.0 (RX)	2.2 - 5.5 (TX) 3.0 - 14.0 (RX)	3.0 - 5.0	3.0 - 5.0	3.0 - 5.5	3.0 - 5.5	3.3 - 5.5	3.3 - 5.5	3.0 - 5.0	2.2 - 5.5	2.2 - 12.0 (TX) 3.0 - 12.0 (RX)	4.2 - 6.0 (TX) 3.0 - 5.0 (RX)	
<b>Supply current **</b>															
TX ( mA )	43	43	16.5 *	20	26	58	44 *	46	48	29	42	3	27 *	60	
RX ( mA )	30	30	28	23	19	19	28	36	55	17	22	7	50	45	
<b>Page No.</b>	4	5	6	7	8	9	10	11	12	13	14	15	16	17	<b>Page No.</b>

\* Values vary by frequency band. Check product details.  
 \*\* Typical values at maximum RF output power unless otherwise noted.  
 \*\*\* Power selectable. Check product details.

Model Parameter	Data Transmitter / Receiver				Data Transceiver					Radio Modem		Telecommand		Audio	Model Regulation
	CDP-TX-02E/EP CDP-RX-02E/EP	CDP-TX-02F CDP-RX-02F	CDP-TX-05M-R CDP-RX-05M-R	CDP-TX-07M/MP CDP-RX-07M/MP	STD-601 (434 MHz)	STD-601 (400 MHz)	STD-302Z	LMD-401	STD-503	SLR-434M	MU-4-434	NK-2.4Y	CDT-TX-02M-R CDT-RX-02M-R	WA-TX-03S WA-RX-03S	
<b>419 MHz</b>							○								
<b>426 MHz</b>													●		ARIB STD-T67
<b>429 MHz</b>							○	○							ARIB STD-T67
<b>434 MHz</b>	● *	● *		● *	●	○	● *			●	●		●		EN 300 220
<b>447 MHz</b>						○	○								
<b>458 MHz</b>						○	○ *								
<b>458 - 462.5 MHz</b>								●							FCC Part 90 ISED RSS-119
<b>806 MHz</b>														●	RCR STD-15
<b>863 MHz</b>														●	EN 301 357
<b>869 MHz</b>				●			●								EN 300 220
<b>915 MHz</b>				○											FCC Part 15.249
<b>2.4 GHz</b>									●			●			EN 300 440 FCC Part 15.247 ISED RSS-247 ARIB STD-T66
<b>Other</b> (Contact Circuit Design)							○								

● : Pre-certified module ○ : Uncertified \* : Receiver category 1 compliance

32ch

# UHF Narrowband Multi Channel Transmitter / Receiver CDP-TX-02E, CDP-RX-02E 434 MHz

The unique and compact CDP-TX/RX-02E is a frequency selectable radio data module for the 434 MHz UHF band. Both CDP-TX-02E (transmitter) and CDP-RX-02E (receiver) are equipped with a frequency synthesizer system including microprocessor. 32 RF channels are selectable using an onboard 4-bit DIP switch.

The CDP-TX-02EP and CDP-RX-02EP versions are channel selectable using 8 pin terminal allowing you to perform channel selection remotely.

Its small size, low voltage operation, and frequency selectability of CDP-02E make it ideal for various applications in sites where many radio transmitters are operated.

## Features

- 32 frequency synthesized RF channels
- 1 mW / 10 mW selectable
- Low voltage operation
- High sensitivity receiver
- FSK narrowband
- RED EN 300 220
- Receiver category 1

## Applications

- Industrial remote control
- Factory automation (Machine to machine)
- Security systems
- Alarms
- Telemetry systems



## General

Parameter	Specification (All ratings at 25 C unless otherwise noted)
Applicable standard	EN 300 220
Communication method	One way
Emission type	F1D (FSK narrow)
Oscillation system	PLL controlled VCO
Frequency range	433.875 MHz to 434.650 MHz
Number of RF channels	32 ch (25 KHz step)
Channel spacing	25 kHz
Channel selection method	4 bit switch (CDP-TX-02E), 8 pin (CDP-RX-02EP)
Frequency stability	+/- 4.0 ppm or less (-20 to +60 C)
RF bit rate	300 to 4,800 bps (Min. pulse width 208 us, Max. pulse width 20 ms)
Operating temperature	-20 to +60 C (No dew condensation)

## CDP-TX-02E CDP-TX-02EP (Transmitter)

Parameter	Specification
Transmitter type	PLL synthesizer
RF output power	10 mW / 1 mW selectable
Transmitter start up time	50 ms (from power on)
Data input	Digital L = GND, H = Vcc
Deviation	+/- 2.1 kHz (PN9 4,800 bps LPF 20 kHz)
Spurious emission	< -54 dBm (47 to 74, 87.5 to 118, 174 to 230, 470 to 862 MHz) < -36 dBm (Other frequencies below 1000 MHz) < -30 dBm (Frequencies above 1000 MHz)
Adjacent channel leakage power	< -37 dBm (CH 25 kHz / BW 16 kHz / PN9 4,800 bps)
Supply voltage	3.0 to 12 V DC
Supply current	43 mA typ. at 3 V/10 mW 33 mA typ. at 3 V/1 mW
Dimensions	26 x 36 x 10 mm (excluding protrusion)
Weight	14 g (without antenna)

## CDP-RX-02E CDP-RX-02EP (Receiver)

Parameter	Specification
Receiver type	Double Superheterodyne PLL synthesizer
Receiver Category	1
Sensitivity (BER 1%)	-120 dBm typ. at DO PN9 4,800 bps (-20 to +60 C)
Sensitivity (12 dB SINAD)	-120 dBm typ. at AF Dev. +/- 2.0 kHz, CCITT filter (-20 to +60 C)
Adjacent channel selectivity	-50 dBm (+/- 25 kHz)
Blocking	-20 dBm
Spurious radiation	-60 dBm (below 1 GHz) -50 dBm (above 1 GHz)
Data output	Digital L = GND, H = Vcc
Supply voltage	3.0 to 12 V DC
Supply current	30 mA typ. at 3 V 33 mA typ. at 12 V
Dimensions	30 x 50 x 9 mm (excluding protrusion)
Weight	20 g

Specifications are subject to change without prior notice

128ch

# UHF Narrowband Multi Channel Transmitter / Receiver CDP-TX-02F, CDP-RX-02F 434 MHz

The unique and compact CDP-TX/RX-02F is a frequency selectable radio data module for the 434 MHz UHF band. Both CDP-TX-02F (transmitter) and CDP-RX-02F (receiver) are equipped with a frequency synthesizer system including microprocessor. 128 RF channels are selectable using an onboard 7-bit DIP switch.

Its small size, low voltage operation, and frequency selectability of CDP-02F make it ideal for various applications in sites where many radio transmitters are operated.

## Features

- 128 frequency synthesized RF channels
- 1 mW / 10 mW selectable
- Low voltage operation
- High sensitivity receiver
- FSK narrowband
- RED EN 300 220
- Receiver category 1

## Applications

- Industrial remote control
- Factory automation (Machine to machine)
- Security systems
- Alarms
- Telemetry systems



## General

Parameter	Specification (All ratings at 25 degree C unless otherwise noted)
Applicable standard	EN 300 220
Communication method	One way
Emission type	F1D (FSK narrow)
Oscillation system	PLL controlled VCO
Frequency range	433.1875 MHz to 434.7750 MHz
Number of RF channels	128 ch (12.5 kHz step)
Channel spacing	25 kHz
Channel selection method	7 bit switch
Frequency stability	+/- 4.0 ppm or less (-20 to +60 C)
RF bit rate	300 to 4,800 bps (Min. pulse width 208 us, Max. pulse width 20 ms)
Operating temperature	-20 to +60 C (No dew condensation)

## CDP-TX-02F (Transmitter)

Parameter	Specification
Transmitter type	PLL synthesizer
RF output power	10 mW / 1 mW selectable
Transmitter start up time	50 ms (from power on)
Data input	Digital L = GND, H = Vcc
Deviation	+/- 2.1 kHz (PN9 4,800 bps LPF 20 kHz)
Spurious emission	< -54 dBm (47 to 74, 87.5 to 118M, 174 to 230, 470 to 862 MHz) < -36 dBm (Other frequencies below 1000 MHz) < -30 dBm (Frequencies above 1000 MHz)
Adjacent channel leakage power	-37 dBm (CH 25 kHz / BW 16 kHz / PN9 4,800 bps)
Supply voltage	3.0 to 12 V DC
Supply current	43 mA typ. at 3 V/10 mW 33 mA typ. at 3 V/1 mW
Dimensions	26 x 36 x 10 mm (excluding protrusion)
Weight	14 g (without antenna)

## CDP-RX-02F (Receiver)

Parameter	Specification
Receiver type	Double Superheterodyne PLL synthesizer
Receiver Category	1
Sensitivity (BER 1%)	-120 dBm typ. at DO PN9 4,800 bps (-20 to +60 C)
Sensitivity (12 dB SINAD)	-120 dBm typ. At AF fm 1 kHz, Dev. +/- 2.0 kHz, CCITT filter (-20 to +60 C)
Adjacent channel selectivity	-50 dBm (+/- 25 kHz)
Blocking	-20 dBm
Spurious radiation	-60 dBm (below 1 GHz) -50 dBm (above 1 GHz)
Data output	Digital L = GND, H = Vcc
Supply voltage	3.0 to 12 V DC
Supply current	30 mA typ. at 3 V 33 mA typ. at 12 V
Dimensions	30 x 50 x 9 mm (excluding protrusion)
Weight	20 g

Specifications are subject to change without prior notice

# UHF Narrowband Transmitter / Receiver

## CDP-TX-05M-R, CDP-RX-05M-R

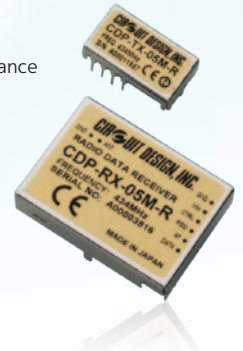
CDP-TX-05M-R and CDP-RX-05M-R are low power narrowband FSK transmitter and receiver modules, designed for industrial applications operating in sub-1 GHz. The modules contain most of the components necessary for radio transmission in compact housing. The RF channel can be selected from 4 preset channels. The receiver is double-superheterodyne and equipped with a SAW filter, ensuring high sensitivity and very good selectivity for stable and long range communication.

### Features

- Low power narrowband FSK with 25 kHz channel spacing
- 4 preset channels
- Low voltage operation
- High receiver sensitivity for long range applications with 600 m or more at line of sight
- High reliability for industrial applications
- Robust metal housing, high selectivity and shock resistance
- Compact Size
- RSSI (Received Signal Strength) output terminal
- RED EN 300 220
- 915 MHz version for US markets

### Applications

- Industrial remote control
- Security / Alarms
- Telemetry / Monitoring systems
- Tracking systems



### General

Parameter	Specification		
	869 MHz A	869 MHz B	915 MHz
Applicable standard	EN 300 220	< -	None
Communication method	One way	< -	< -
Emission type	F1D (FSK narrow)	< -	< -
Frequency (Ch 3) *1	869.7500	868.6625	914.500
(Ch 2)	868.3000	869.2125	914.700
(Ch 1)	869.8000	869.2750	914.750
(Ch 0)	869.9250	869.3625	914.825
RF bit rate	100 to 4,800 bps	< -	< -
Frequency stability	+/- 2.5 ppm	< -	< -
Operating temperature	-20 to +65 C	< -	< -

\*1 Factory default frequency channel setting

### CDP-TX-05M-R (Transmitter)

Parameter	Specification		
RF output power	5 mW	< -	1 mW
Deviation	+/- 3 kHz	< -	< -
Supply voltage	2.2 to 5.5 V	< -	< -
Supply current at 3.0 V	16.5 mA	< -	14 mA
Dimensions	22 x 12 x 6 mm	< -	< -
Weight	3 g	< -	< -
Data input	Digital L = GND, H = Vcc	< -	< -
Spurious emission	< -54 dBm (Frequencies below 862 MHz)	< -	< -50 dBm (Frequencies below 862 MHz)
	< -36 dBm (862 MHz to 1000 MHz)	< -	< -50 dBm (862 MHz to 1000 MHz)
	< -30 dBm (Frequencies above 1000 MHz)	< -	< -46 dBm (Frequencies above 1000 MHz)
Adjacent channel leakage power	< -37 dBm (CH 25 kHz / BW 16 kHz / PN9 4,800 bps)	< -	-

### CDP-RX-05M-R (Receiver)

Parameter	Specification		
Receiver type	Double superheterodyne	< -	< -
Receiver Category	1.5	< -	None
IF frequency	21.7 MHz / 450 kHz	< -	< -
Sensitivity (BER<0.1%)	-111 dBm	< -	< -
Supply voltage	3 to 14 V	< -	< -
Supply current at 3V	28 mA	< -	< -
Dimensions	36 x 26 x 8 mm	< -	< -
Weight	13 g	< -	< -
Data output	Digital L = GND, H = Vcc	< -	< -
Adjacent channel selectivity	45 dB	< -	60 dB

Specifications are subject to change without prior notice

**CIRCUIT DESIGN, INC.**

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CDP-TX/RX-05M-R ver. 1.4 Jan. 2021

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# UHF Narrowband Transmitter / Receiver

## CDP-TX-07M, CDP-RX-07M 434 MHz

CDP-TX-07M and CDP-RX-07M are low power narrowband FSK transmitter and receiver modules, designed for industrial applications operating in the 434 MHz ISM band. The modules contain most of the components necessary for radio transmission in compact housing. The operating RF channel can be selected from 4 preset channels selected through the use of jumpers. The receiver is double-superheterodyne and equipped with a SAW filter, ensuring high sensitivity and very good selectivity for stable and long range communication.

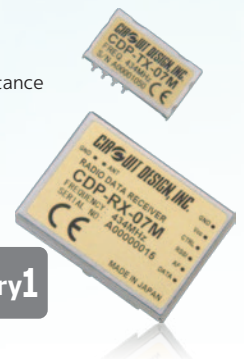
The CDP-TX-07MP and CDP-RX-07MP are channel selectable using a 2 pin terminal allowing you to perform channel selection remotely. In addition, each of the 4 preset channels are reprogrammable using values in the range 434.075 to 434.700 MHz with 25 kHz spacing.

### Features

- Low power narrowband FSK with 25 kHz channel spacing
- 4 preset channels containing 4 frequencies in the 434 MHz band
- Low voltage operation
- High receiver sensitivity for long range applications with 600 m or more at line of sight
- High reliability for industrial applications
- Robust metal housing, high selectivity and shock resistance
- Compact Size
- RED EN 300 220
- Receiver Category 1

### Applications

- Industrial remote control
- Security / Alarms
- Telemetry / Monitoring systems
- Tracking systems



### General

Parameter	Specification
Applicable standard	EN 300 220
Communication method	One way
Emission type	F1D (FSK narrow)
Number of RF channels	4
Frequency (Ch 3) *1	434.0750
(Ch 2)	433.9200
(Ch 1)	434.6000
(Ch 0)	434.7000
RF bit rate	100 to 4,800 bps
Frequency stability	+/- 2.5 ppm
Operating temperature	-20 to +65 C

\*1 Factory default frequency channel setting

### CDP-TX-07M (Transmitter)

Parameter	Specification
RF output power	10 mW
Transmitter start up	< 20 ms
Deviation	+/- 3 kHz
Supply voltage	2.2 to 5.5 V
Supply current at 3.0 V	20 mA
Dimensions	22 x 12 x 4.5 mm
Weight	2 g
Data input	Digital L = GND, H = Vcc
Spurious emission	< -54 dBm (Frequencies below 862 MHz)
	< -36 dBm (862 MHz to 1000 MHz)
	< -30 dBm (Frequencies above 1000 MHz)
Adjacent channel leakage power	< -37 dBm (CH 25 kHz / BW 16 kHz / PN9 4,800 bps)

### CDP-RX-07M (Receiver)

Parameter	Specification
Receiver type	Double superheterodyne
Receiver Category	1
IF frequency	21.7 MHz / 450 kHz
Sensitivity (12 dB/SINAD) (BER<0.1%)	-120 dBm
Supply voltage	3 to 14 V
Supply current at 3 V	23 mA typ.
Dimensions	36 x 26 x 8 mm
Weight	13 g
Data output	Digital L = GND, H = Vcc
Adjacent channel selectivity	45 dB

Specifications are subject to change without prior notice

# Narrowband radio transceiver

## STD-601 434 MHz

The STD-601 434 MHz is a miniature 434 MHz band transceiver designed for industrial remote control applications. This module conforms to the EN 300 220 standard.

The STD-601 434 MHz has a simple serial interface and allows own communication protocol to be used. The RF power, data rate and channel can be set through the use of dedicated serial commands.

### Features

- Small 20 x 32 x 5 mm SMD
- Low current consumption
  - 26 mA (TX 10 mW, 3 V)
  - 19 mA (RX)
- Transparent interface for data input and output
- RED EN 300 220

### Applications

- Industrial telecontrol
- Telemetry Systems



### General

Parameter	Specification	Remarks
Applicable standard	EN 300 220	
Communication method	One Way, Half Duplex	
Emission type	F1D ( 2-GFSK )	
Supply voltage	3.0 to 5.0 V	
Operating temperature	-20 to +65 C	(-30 to +75 C)**
Frequency stability	+/- 3 ppm (-20 to +65 C)	
Dimensions	20 x 32 x 5 mm	
Weight	4.5 g	

### RF

Parameter	Specification	Remarks
Frequency	433.0750 to 434.7750 MHz	
No. of RF channels	137 ch	
RF bit rate	4,800 / 9,600 bps	
Supply current (TX)	26 mA typ.	TX: 10 mW
Supply current (RX)	19 mA typ.	
RF output power	10 / 5 / 1 mW	Nominal
Spurious emission (TX)	< -54 dBm (47 to 74, 87.5 to 118, 174 to 230, 470 to 862 MHz) < -37 dBm ( Other frequencies below 1000 MHz ) < -30 dBm ( Frequencies above 1000 MHz )	
Adjacent channel leakage power	< -37 dBm	(CH 25 kHz / BW 16 kHz / PN9 9,600 bps)
Receiver sensitivity		
- 9,600 bps	-113 dBm BER (1% error)	PN9
- 4,800 bps	-117 dBm BER (1% error)	PN9
Adjacent channel selectivity	50 dB (+/- 12.5 kHz) @ 4,800 bps 50 dB (+/- 25 kHz) @ 9,600 bps	2 signal method, PN9, 1% error 2 signal method, PN9, 1% error
Spurious emission (RX)	-57 dBm (Frequencies below 1000 MHz) -47 dBm (Frequencies above 1000 MHz)	
Blocking	70 dB	+/- 2 MHz, +/- 10 MHz

### Timing

Parameter	Specification	Remarks
Power on to TX/RX	350 ms typ.	
TX/RX switching time	10 ms typ.	

### Interface

Parameter	Specification	Remarks
Data Interface ( DI / DO )	Digital L = GND H = Vcc, Asynchronous	Transparent interface
Command interface ( TXD / RXD )	UART 9,600 / 19,200 / 38,400 bps, 8 data bit, No parity, 1 stop bit	

\* Unless otherwise specified, specifications are typical values obtained under 9,600 bps, 10 mW, 25 C, 434 MHz, 3 V

\* Specifications are subject to change without prior notice

\*1 Possible but operation to specification not guaranteed

# Narrowband radio transceiver

## STD-601 400 MHz

The STD-601 400 MHz is a miniature transceiver designed for industrial applications. This module has selectable bands in a wide frequency range in the region of 400 MHz, conforming to the ISM bands in various countries.

The STD-601 400 MHz has a simple serial interface and allows own communication protocol to be used. The RF power, data rate and channel can be set through the use of dedicated serial commands.

### Features

- Small 20 x 32 x 5 mm SMD
- Selectable bands possible within wide frequency range.
  - 429 MHz (Japan) / 434 MHz (EU)
  - 447 MHz (Korea) / 458 MHz (UK)
- Maximum RF Power 50 mW
- Transparent interface for data input and output

### Applications

- Industrial remote control systems
- Telemetry systems



### General

Parameter	Specification	Remarks
Applicable standard	-	
Communication method	One Way, Half Duplex	
Emission type	F1D ( 2-GFSK )	
Supply voltage	3.0 to 5.0 V	
Operating temperature	-20 to +65 C	(-30 to +75 C)**
Frequency stability	+/- 3 ppm (-30 to +75 C)	
Dimensions	20 x 32 x 5 mm	
Weight	4.5 g	

### RF

Parameter	Specification	Remarks
Frequency	(429 MHz band) 429.1750 to 429.7375 MHz (434 MHz band) 433.0750 to 434.7750 MHz (447 MHz band) 447.2750 to 447.9875 MHz (458 MHz band) 458.5000 to 459.1750 MHz	(47 ch) (137 ch) (59 ch) (28 ch)
RF bit rate	1,200 / 2,400 / 4,800 / 9,600 / 19,200 bps	
Supply current (TX)	35 mA typ. 58 mA typ.	RF 10 mW RF 50 mW
Supply current (RX)	19 mA	
RF output power	50 / 25 / 20 / 10 / 5 / 1 mW	Nominal
Spurious emission (TX)	< -54 dBm (47 to 74, 87.5 to 118, 174 to 230, 470 to 862 MHz) < -37 dBm ( Other frequencies below 1000 MHz ) < -30 dBm ( Frequencies above 1000 MHz )	
Adjacent channel leakage power	< -37 dBm	(CH 25 kHz / BW 16 kHz / PN9 9,600 bps)
Receiver sensitivity	-9,600 bps -113 dBm BER (1% error) -4,800 bps -117 dBm BER (1% error)	PN9 PN9
Adjacent channel selectivity	50 dB (+/- 12.5 kHz) @ 4,800 bps 50 dB (+/- 25 kHz) @ 9,600 bps	2 signal method, PN9, 1% error 2 signal method, PN9, 1% error
Spurious emission (RX)	-57 dBm (Frequencies below 1000 MHz) -47 dBm (Frequencies above 1000 MHz)	
Blocking	70 dB	+/- 2 MHz, +/- 10 MHz

### Timing

Parameter	Specification	Remarks
Power on to TX/RX	350 ms typ.	
TX/RX switching time	10 ms typ.	

### Interface

Parameter	Specification	Remarks
Data Interface ( DI / DO )	Digital L = GND H = Vcc, Asynchronous	Transparent interface
Command interface (TXD / RXD)	UART 9,600 / 19,200 / 38,400 bps, 8 data bit, No parity, 1 stop bit	

\* Unless otherwise specified, specifications are typical values obtained under 9,600 bps, 10 mW, 25 C, 434 MHz, 3 V  
 \* Specifications are subject to change without prior notice  
 \*1 Possible but operation to specification not guaranteed



# UHF Narrowband Multi Channel Transceiver STD-302Z 434 MHz

The UHF FM narrowband semi-duplex radio module STD-302Z 434 MHz is suitable for industrial remote control and telemetry applications operated in 434 MHz ISM band. SAW filter and narrowband technique provides reliable data communication in industrial applications where interference rejection and practical distance range is required. Suitable for feedback systems.

## Features

- 10 mW RF power
- Programmable RF channel
- Receiver sensitivity -119 dBm
- Excellent vibration and shock resistance / Mechanical durability
- FSK narrowband
- RED EN 300 220
- Receiver Category 1
- 419 MHz (China) / 429 MHz (Japan) / 447 MHz (Korea) / 458 MHz (UK) / 869 MHz (EU) available

## Applications

- Industrial remote control system
- Telemetry system
- Data transmission



## General

Parameter	Specification (All ratings at 25 C unless otherwise noted)
Applicable standard	EN 300 220
Communication method	Half duplex
Emission type	F1D (FSK narrow)
Frequency range	433.075 to 434.775 MHz
Channel step	25 kHz Channel Programmable
Frequency stability	+/- 3.5 ppm (-20 to +60 C)
RF bit rate	9,600 bps max (pulse width min. 100 us, max 15 ms)
PLL reference frequency	21.25 MHz
PLL response	30 ms typ. (from PLL setting to LD out)
PLL input method	PLL serial data with lock detect indicator output
Supply voltage	3.0 to 5.5 V
Supply current	44 mA (TX), 28 mA (RX)
Operating temperature	-20 to +60 C (Storage : -30 to +75 C)
TX/RX switching time	15 ms typ. (DI vs valid DO at the same frequency)
Dimensions	30 x 50 x 9 mm
Weight	25 g

## Transmitter part

Parameter	Specification
Transmitter type	PLL synthesizer
RF output power	10 mW at 50 ohm
Deviation	+/- 2.75 kHz (PN9 9,600 bps)
Data input	Digital L = GND, H = 3 V to Vcc
Spurious emission	< -54 dBm (47 to 74, 87.5 to 118, 174 to 230, 470 to 790 MHz) < -36 dBm (Frequencies below 1000 MHz) < -30 dBm (Frequencies above 1000 MHz)
Adjacent channel leakage power	-37 dBm (CH 25 kHz / BW 17.5 kHz / PN9 9,600 bps)

## Receiver part

Parameter	Specification
Receiver type	Double superheterodyne
Receiver category	1
IF	21.7 MHz (1st), 450 kHz (2nd)
Maximum input level	+10 dBm
Receiver sensitivity	-119 dBm (12 dB SINAD) -116 dBm (BER 1%)
Data output	Digital L = GND, H = 2.8 V
Adjacent channel selectivity	-50 dBm (+/- 25 kHz)
Blocking	-20 dBm

Specifications are subject to change without prior notice

# UHF Narrowband Multi Channel Transceiver LMD-401 458 - 462.5 MHz

LMD-401 458 to 462.5 MHz is a synthesized multi channel transceiver module designed to meet FCC Part 90 and IC RSS-119 for US market and Canada. This small, highly integrated and fully shielded module is designed for embedding in user equipment. The module is suitable for various low power industrial telecontrol and telemetry applications.

## Features

- FCC Part 90 and IC RSS-119 compliant
- 458 to 462.5 MHz band
- Programmable RF channel with 12.5 kHz channel space
- 10 mW, GFSK 4,800 bps
- Low power operation 3 to 5.5 V, 46 mA / TX, 36 mA / RX
- Small size 50 x 30 x 9 mm
- Excellent vibration & shock resistance / Mechanical durability
- Wide operation range -20 to +65 C



## Applications

- Industrial remote control
- Remote monitoring / SCADA / Security
- Telemetry
- Data acquisition



## General

Parameter	Specification (All ratings at 25 C unless otherwise noted)
Applicable standard	FCC Part 90.217 / IC RSS-119
Communication method	Half-duplex
Emission type	F1D (GFSK narrow)
Frequency range	458 to 462.5 MHz
Channel spacing	12.5 kHz / Channel programmable
Frequency stability	+/- 2.5 ppm (-20 to +60 C)
Aging rate	+/- 1 ppm / year
RF bit rate	4,800 bps max. (Pulse width min. 200 us, max. 15 ms)
Operating temperature	-20 to +65 C (Storage -30 to +75 C)
TX/RX switching time	15 ms typ. (DI vs DO)
Supply voltage	3.0 to 5.5 V
Supply current	46 mA (TX), 36 mA (RX)
Dimensions	50 x 30 x 9 mm
Weight	25 g

## Transmitter part

Parameter	Specification
RF output power	10 mW at 50 ohm (25 C)
Deviation	+/- 2.4 kHz (PN9 4,800 bps)
Data input	Digital L = GND, H = 3 V to Vcc
Spurious emission	< -37 dBm (Frequencies below 1000 MHz)
	< -31 dBm (Frequencies above 1000 MHz)
Adjacent channel leakage power	-20 dBm (+/- 12.5 kHz / PN9 4,800 bps)

## Receiver part

Parameter	Specification
Receiver type	Double superheterodyne
IF	21.7 MHz (1st), 450 kHz (2nd)
Maximum input level	10 dBm
Receiver sensitivity	-116 dBm typ. (12 dB SINAD)
	-116 dBm typ. (BER 1%)
Co-channel rejection	-7 dB (D/U ratio)
Spurious response rejection	-44 dBm (1st mix, 2nd mix, 2 signal method)
Blocking	-20 dBm (+/- 2 MHz, +/- 10 MHz, +/- 5%, 2 signal method)
Data output	Digital L = GND, H = 2.8 V
Adjacent channel selectivity	-50 dBm (+/- 12.5 kHz, 2 signal method)
Blocking	-20 dBm (+/- 2 MHz, +/- 10 MHz, +/- 5%, 2 signal method)

Specifications are subject to change without prior notice

# DSSS low power radio transceiver

## STD-503 2.4 GHz

The STD-503 is a 2.4 GHz transceiver enclosed in a small compact shield casing designed for industrial applications. The transceiver uses Direct Sequence Spread Spectrum (DSSS) modulation and true diversity circuit, enabling reliable communications even in the congested 2.4 GHz band.

The STD-503 complies with the European EN 300 440, U.S FCC Part 15.247, Canadian ISED RSS-210 and Japanese ARIB STD-T66 standard, making it ready for the global market.

Low power consumption and battery operation give the STD-503 the performance demanded for applications where long range and reliability are required.

The transceiver uses a transparent data interface to enable users to communicate using their own protocols.

The module's configuration can be set easily via the UART interface using dedicated commands.

\*Circuit Design developed an onboard ASIC containing SS correlator (a key part of spread spectrum communication). This ensures long term supply for industrial applications.

### Features

- CE, FCC, ISED and ARIB conformity certification
- Uses direct sequence spread spectrum (DSSS) modulation
- Channel stepping option controlled via CHC pin
- A true diversity receiver (two built-in receiver circuits)
- Module settings using dedicated commands
- Data communication uses a transparent interface
- Low power operation
- 77 channels
- Range 300 m LOS
- Onboard temperature sensor
- FCC Part 15.247 / ISED RSS-210 / ARIB-STD-T66 / RED EN 300 440



### Applications

- Industrial telecontrol
- Telemetry Systems



### General

Parameter	Specification	Remarks
Applicable standard	EN 300 440 / FCC Part 15.247 ISED RSS-210 / ARIB STD-T66	
Communication method	Simplex	
Emission type	F1D (FSK)	
Frequency range	2402.5 to 2478.5 MHz	
Number of RF channels	77	
Channel spacing	1 MHz	
RF chip rate	288 kcps	
Supply voltage	3.3 to 5.5 V	
Supply current	TX:48 mA RX:55 mA Typ.	
RF output power	Max. 10 mW	EIRP
Receiver sensitivity	-93 dBm	19.2 kbps BER 0.1%
Operating temperature	-20 to +65 C (storage -30 to +80 C)	No dew condensation
Dimensions	40 x 29 x 5.5 mm	Not including connectors
Weight	10 g	
RF connectors	MHF x 2	

### Interface

Parameter	Specification	Remarks
Data Interface (DI / DO)	19,200 bps	Sync: CLK terminal
Command Interface (TXD / RXD)	UART communication (RS-232C)	
- Communication method	Asynchronous	
- UART bit rate	19,200 / 38,400 / 57,600 bps	
- Flow Control	None	
- Other parameters	Data Length: 8 bit, Parity:None, Stop Bits:2	

Specifications are subject to change without prior notice

# Low Power Radio Modem SLR-434M 434 MHz

The SLR-434M is a narrowband embedded radio modem for the 434 MHz ISM band. Compact and designed for ease of use, it incorporates LoRa® technology to achieve extremely long range at low power, albeit at low bit rate. Its superior sensitivity allows the possibility of communication into areas once considered difficult for RF to penetrate.

The SLR-434M uses a dedicated command system with a simple to use proprietary protocol. In addition to serial data transmission, the module also includes 8 x IO ports for switching signals allowing transmission of signals from sensors or for driving relays.

## Features

- Narrowband
- RED EN 300 220
- Extremely long range operation achieved by LoRa mode.
- Higher resistance to urban noise, enabling long range operation
- Switchable between FSK mode and LoRa mode
- UART interface
- Transmission of up to 8 switching signals
- Low power consumption makes battery power operation possible
- Compact size
- 429 MHz (Japan) available

## Applications

- Data transmission, building air conditioning control
- Debris flow monitoring at mudslide control dams
- River water level / dam gate management
- Greenhouse temperature / humidity monitoring and control
- Monitoring of tunnels and bridges



## General

Parameter	Specification	Remark
Applicable Standard	EN 300 220	
Communication method	Simplex or half duplex	
Emission type	F1D	
RF Output Power	< 10 mW	SMA / 50 ohm
RF Bit Rate	4,800 bps (FSK) or 15 to 245 bps (LoRa)	Actual speed with LoRa depends on chip rate
Frequency range	433.075 to 434.7750 MHz	
Number of Channels	137	Channel Step: 12.5 kHz
Receiver Sensitivity	-115 dBm (FSK), -133 dBm (LoRa 128 chip)	PER 1% with the user data of 45 bytes or less
Supply voltage	3.5 to 5.0 V	Recommended
Supply current	TX: 29 mA (Typ), RX: 17 mA (Typ)	@5 V
External Dimensions	40 x 29 x 6.2 mm	Not including antenna connector
Modulation	2-FSK or LoRa	
No. of sw inputs	8	

## Serial interface

Parameter	Specification
Communication method	Serial communication (RS232)
Synchronization	Asynchronous / UART
Data Speed	19,200 bps
Flow Control	Hardware: RTS/CTS pin Software: Xon/Xoff not used
Parameter	Data length: 8 bit, Parity: None, Stop Bit: 1

Specifications are subject to change without prior notice

The SLR-434M contains a Semtech's LoRa® wireless RFIC.  
The LoRa® Mark and LoRa Logo are trademarks of Semtech corporation.

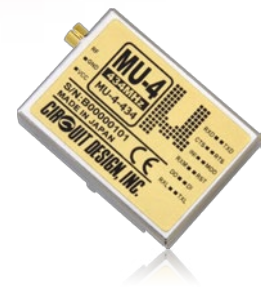
# Embedded low power radio modem MU-4-434 434 MHz

The MU-4-434 is an embedded radio modem operating in the 434 MHz ISM band designed as the successor to the MU-2-R with improved in-band blocking performance. Dedicated commands, specially designed for wireless application, are provided for building a range of wireless system, from simple control systems to wide network systems. Using the commands, the user can concentrate on designing the application without needing to be aware of the radio protocol and control aspects. Reed-Solomon code is used for forward error correction (FEC) to maintain data integrity and provide highly reliable wireless communication. The MU-4-434 meets the requirements of the European RE Directive and carries the CE mark.

The relay feature allows you to extend the range by using additional units (up to 10 units)

## Features

- UART interface with simple command protocol compatible with MU-2-R
- 434 MHz ISM band Pre-programmed 127 channels
- 10 mW / 1 mW power selectable
- Error correction with Reed-Solomon code
- Repeater and auto answer back function
- Target station receive signal and noise level acquisition
- Low power operation, TX 42 mA @3 V
- Optional transparent mode
- RED EN 300 220



## Applications

- Telemetry - Environment monitoring, Meter reading, various measuring applications
- Telecontrol - Remote control for industrial equipment
- Security - Various alarm and monitoring systems



## General

Parameter	Specification	Remarks
Applicable standard	EN 300 220	
Communication method	Half-duplex	
Emission type	F1D (FSK narrow)	
RF output power	10 mW / 1 mW selectable	Nominal, Contact (50 ohm)
RF bit rate	4,800 bps	
Frequency range	433.2000 to 434.7750 MHz	
Channel spacing	12.5 kHz	
Number of RF channels	127	Channel step 12.5 kHz
Receiver sensitivity	-113 dBm	Transparent mode BER 0.1% error
Operating temperature	-20 to +65 C	The operation distance varies with the temperature conditions
Supply voltage	3.0 to 5.0 V	Absolute max. rate 5.5 V
Supply current	TX: 42 mA RX: 22 mA @ 3 V TX: 26 mA RX: 22 mA @ 3 V	10 mW RF out 1 mW RF out
Dimensions	36 x 26 x 8 mm	
Weight	14.5 g	Not including antenna

Reference data

\* Effective radio communication speed: About 3,400 bps (Conditions: One-way communication, no error correction, 25 C)

\* Range: About 600 m (Conditions: One-way, no error correction, 25 C, line of sight distance, antenna height of 1.5 m, vertical antenna)

## Serial interface

Parameter	Specification
Communication method	Serial communication (RS232)
Synchronization	Asynchronous / UART
Data speed	1,200 / 2,400 / 4,800 / 9,600 / 38,400 / 57,600 bps
Flow control	RTS / CTS hardware flow control
Parameter	Data length: 8 bit / Parity: (No, Odd, Even) / Stop bit: 1 or 2

Specifications are subject to change without prior notice

# Telecommand radio module NK-2.4Y 2.4 GHz

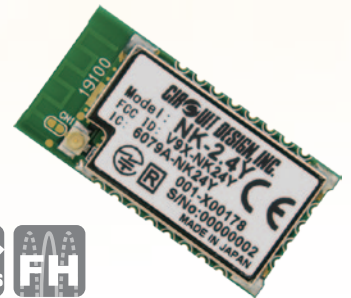
NK-2.4Y is an embedded input/output module which operates in 2.4 GHz band. In spite of small size and low power consumption, it achieves the communication range of 100 m (line of sight).

Our original frequency hopping protocol allows multiple modules to be used in one area simultaneously without concern about radio channels. With a fast input-output response time of 20 ms, a maximum of 8 switch inputs/outputs can be transmitted. Regarding an antenna, customers can select either internal PCB antenna or external antenna specified by Circuit Design.

Link signal output shows connection status, which help the user to stay within the signal coverage area.

## Features

- Module can be set to either input or output mode.
- CRC-16 Error Detection
- Achieves a Hamming distance of 6 to minimize malfunction
- Transmission of max 8 switching signals by connecting simple external circuitry
- Communication LOS: 100 m
- Low current consumption
- Rapid two way communication for confirmation of communication link status.
- 1:1 communication only
- Frequency hopping allows multiple systems in one area without concern about channel management
- FCC Part 15 / ISCED RSS-247 / ARIB-STD-T66 / RED EN 300 440



## Applications

- Remote Tail lifts on trucks, Remote control of care lifts on welfare vehicles  
Shutter open and close



## Radio Part

Parameter	Specification	Remarks
Applicable standard	FCC Part 15 / ISCED RSS-247 ARIB STD-T66 / EN 300 440	
Communication method	Simplex	Two-way between paired modules
Communication range	100 m	Line of sight
Communication mode	1:1	(Input mode: Output mode)
Frequency range	2403 to 2479 MHz	Frequency Hopping
Operating temperature	-30 to +65 C	
Antenna	Internal pattern antenna or specified external antennas	
Supply Voltage	2.2 to 5.5 V	
Input / Output response	30 to 60 ms	
Communication bitrate	250 kbps	
Weight	3.2 g	
Dimensions	35.3 x 17.8 x 3.5 mm	
Soldering Conditions	Hand Soldering	Soldering iron temp: 350 C within 3 sec

## NK-2.4Y (Input mode)

Parameter	Specification	Remarks
RF output power	1.4 mW	(+20%, -80%)
Supply Current	Typ. 3 mA ave.	
Inputs	8 Switch inputs	
Input voltage range	-0.3 V to REG + 0.3 V	REG = Internal voltage 2.058 to 2.142 V
Input voltage threshold	Low Level: 0.4 V (max) High Level: 1.7 V (min)	
Hamming Distance	6	

## NK-2.4Y (Output mode)

Parameter	Specification	Remarks
Supply Current	When linked: Typ. 7 mA ave. During linking: Typ. 14 mA ave.	
Outputs	8 switch outputs	
Output voltage range	0.3 V to REG + 0.3 V	REG = Internal voltage 2.058 to 2.142 V
Output voltage threshold	Low Level: 0.9 V (max) High Level: 1.1 V (min)	
Output holding time when communication shutoff	400 ms typ.	

Specifications are subject to change without prior notice

# UHF Narrowband Telecommand Module

## CDT-TX-02M-R, CDT-RX-02M-R

CDT-TX-02M-R and CDT-RX-02M-R are telecommand transmitter and receiver which are specially designed for switching signal transmission. The RF channel is fixed but selectable from 4 preprogrammed channels. In addition to the RF part, the module includes MSK modem and Photo MOS relays (RX) in its robust metal housing.

A handy transmitter can be easily made only by connecting a switching board to the CDT-TX-02M-R.

### Features

- 6 switch inputs and outputs
- Standby mode in TX
- 4 operation modes in RX
- Low voltage and consumption current
- MSK modem equipped
- Long range control
- RED EN 300 220

### Applications

- Remote control for motor operated shutter blinds, garage doors, gates etc.
- Industrial remote control
- Security / Alarms
- Paging system



### General

Parameter	Specification	Remarks
Applicable standard	EN 300 220	
Communication method	One way	MSK 1,200 bps
Emission type	F2D (Sub-carrier MSK)	
Communication range	500 to 1,000 m	Line-of-sight
Number of RF channels	4	Adjust using DIP switches
Frequency*	434.075 / 433.920 / 434.600 / 434.700 MHz	
Operating temperature	-20 to +60 C	No dew condensation

### CDT-TX-02M-R (Transmitter)

Parameter	Specification	Remarks
Transmitter type	PLL controlled VCO	
RF output power	10 mW	
Supply voltage	2.2 to 12 V (Max. rating 14.5 V)	
Supply current	TX: 27 mA, Stand-by: 1 uA	
Inputs	6 Switch inputs	Negative logic
Antenna	1/4 lambda whip antenna	
Dimensions	36 x 26 x 8 mm	Excluding protrusion
Weight	15 g	

### CDT-RX-02M-R (Receiver)

Parameter	Specification	Remarks
Sensitivity	-120 dBm	BER 1%
Supply voltage	3.0 to 12 V (Max. rating 14.5 V)	
Supply current	6-outputs Off: 16 mA, On: 50 mA	
Operation mode	One-shot, Toggle, Keying, Continuous	Set by 3 input ports
Outputs	6-photo MOS relay outputs	
Output relay	Max switching voltage and current, 48 V 100 mA	
Antenna	1/4 lambda whip antenna	
Dimensions	53 x 35 x 12 mm	Excluding protrusion
Weight	35 g	

Specifications are subject to change without prior notice

\*Other frequency: Please contact Circuit Design, Inc.

# UHF Multi Channel Wireless Audio Transmitter / Receiver WA-TX-03S, WA-RX-03S 863 MHz

The WA-TX-03S / WA-RX-03S are 15 ch multichannel audio modules for analogue audio transmission. They operate in the European harmonized 863 to 865 MHz band with RF power selection of 5 and 10 mW. In addition to offering a frequency response range sufficient for voice transmission, the compander noise reduction system has a wide dynamic range, enabling transmission of clear audio signals. As embedded devices, they include nearly all the parts necessary for audio transmission in a small shielding case, making it possible to develop audio transmission equipment in a short time.

## Features

- 863 to 865 MHz European audio band
- Selectable RF output ( 5 mW and 10 mW )
- 15 channels with 125 kHz
- Built in noise reduction systems
- Built in mute circuit
- Easy installation for user system
- RED EN 301 357

## Applications

- Audio guiding at museum
- Tour guide system
- Wireless conference system
- Wireless microphone system for amateur users
- Various audio transmissions



## General

Parameter	Specification
Applicable standard	EN 301 357
Communication method	One way
Emission type	F3E (FM)
Number of RF channels	15
Frequency range	863.125 to 864.875 MHz
Distance	50 m (line of sight)
Dynamic range	90 dB or more (W/IHF-A Filter)
Audio Frequency response	50 Hz to 13 kHz +/- 3.5 dB
T.H.D	2 % or less (@AF 1 kHz, Dev. = 20 kHz)
Emphasis	50 us
Operating temperature	0 to 50 C

## WA-TX-03S (Transmitter)

Parameter	Specification
Oscillation type	Crystal based PLL oscillation
RF output power	5 mW, 10 mW (e.r.p)
Frequency stability	+/- 15 kHz
Noise reduction type	Compander
Spurious emission	1 uW Max.
Deviation	20 kHz (1 kHz @ -25 dBv)
Audio input level	-113 to -13 dBv (1 kHz)
Audio input impedance	12 kohm or more
Max.DC input to audio input	7 V DC Max.
Supply voltage	4.2 to 6 V**
Supply current	50 mA (5 mW), 60 mA (10 mW), < 1 mA (Standby)
Dimensions	36 x 26 x 8 mm
Weight	13 g

## WA-RX-03S (Receiver)

Parameter	Specification
Receiving method	Single superheterodyne
Local oscillation type	Crystal based PLL oscillation
IF frequency	10.7 MHz
Noise reduction type	Expander
Sensitivity	S/N 55 dB at 21 dBuV (-92 dBm)
Squelch sensitivity	Adjustable
Audio output level	-10 dBv (Dev. 20 kHz),
Audio output impedance	20 kohm or less
Supply voltage	3 to 5 V
Supply current	45 mA
Dimensions	36 x 26 x 8 mm
Weight	13 g

\*0 dBv = 0.775 V

\*Data of specification is measured at 25 C unless otherwise specified.

\*\*Supply voltage 3.6 to 7 V, possible operating range without meeting full specifications

Specifications are subject to change without prior notice



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