DATASHEET

EETX433A

Crystal-less Multifunctional RF Transmitter

Low-power RF solution for wireless remote control

TRANSMIT POWER	MODULATION
13 dBm	OOK / ASK

SLEEP CURRENT	TRANSMIT CURRENT
800 nA	12 mA

VERSION	PACKAGE INFORMATION	DEVELOPED BY	REVISION
v1.0	SOP8	Engeletron Engenharia	v1.3 · 2026-06-03

Features

Transmit power	13 dBm
Modulation	OOK / ASK
Sleep current	800 nA
Transmit current	12 mA
Frequencies	433.92 MHz
Supply voltage	2.0 V – 3.6 V
Package	SOP-8
Certifications	FCC, CE, ANATEL

Applications

- Automatic gates and doors
- Access control
- Property and home alarms
- Automotive alarms
- Electric fences
- Fire detection
- Wireless doorbells
- Panic button
- Home and building automation
- Low-power wireless sensors (IoT)

Overview

The EETX433A integrates a 433 MHz PLL oscillator, an RF transmitter, and a microcontroller (8-bit MCU core) on a single chip, delivering a simpler design, more flexible encoding, lower cost, and a smaller footprint — fully compliant with FCC, CE and ANATEL standards.

A built-in key-detection auto-shutdown feature minimizes standby current. The device also integrates output overcurrent protection, on-chip over-temperature protection, and supply undervoltage protection.

Building a complete wireless transmission system with the EETX433A requires only 2 inductors, 4 capacitors, resistors, a battery, and buttons — a fully integrated solution for remote control applications.

Functional Block Diagram

The EETX433A integrates on a single die all blocks required for a standalone 433.92 MHz RF transmitter: reference oscillator, PLL for carrier synthesis, OOK/ASK modulator, power amplifier, 8-bit MCU with code ROM, power-management (UVLO/OTP/OCP), and operating-mode selection logic (CFG).

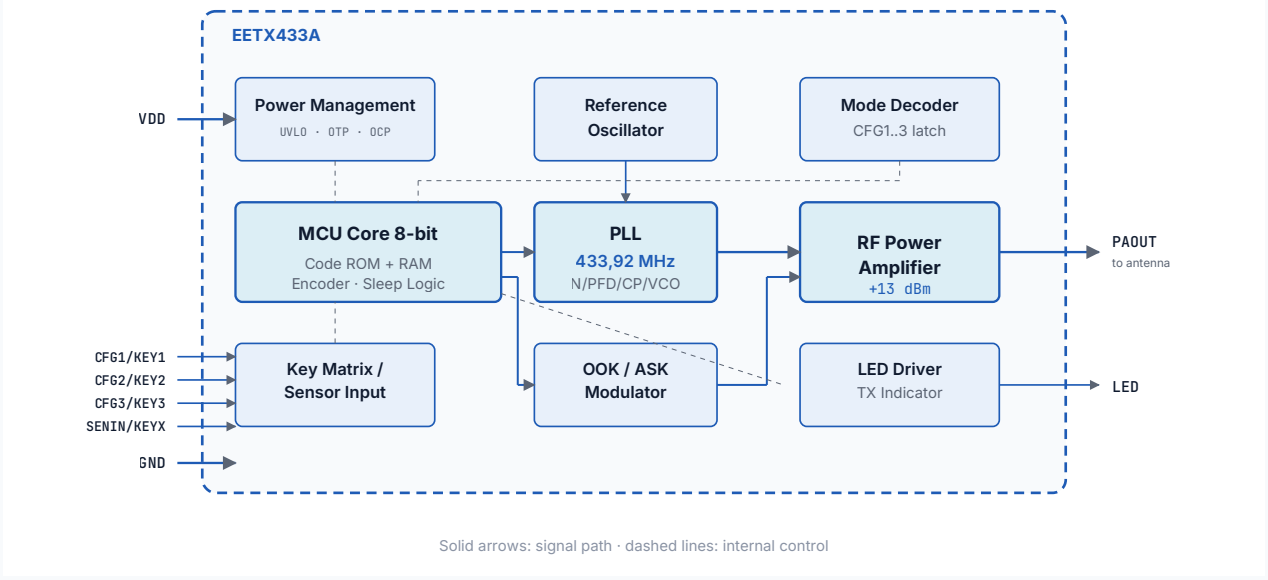
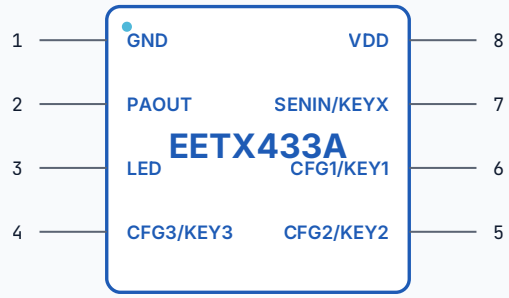


Figure 1: EETX433A internal functional block diagram

Pinout & Pin Configuration



SOP-8 (top view)

Pin Description

Pin	Name	I/O	Function
1	GND	P	Power ground reference.
2	PAOUT	O	Power amplifier (PA) output.
3	LED	O	Data transmission indicator (LED driver).
4	CFG3/ KEY3	I	Input pin. At power-up it sets operating-mode/sensor-type Configuration 3 (CFG3). In Mode 0 it is the direct key input KEY3 and also participates in the key matrix (see Figure 5).
5	CFG2/ KEY2	I	Input pin. At power-up it sets operating-mode/sensor-type Configuration 2 (CFG2). In Mode 0 it is the direct key input KEY2 and also participates in the key matrix (see Figure 5).
6	CFG1/ KEY1	I	Input pin. At power-up it sets operating-mode/sensor-type Configuration 1 (CFG1). In Mode 0 it is the direct key input KEY1 and also participates in the key matrix (see Figure 5).
7	SENIN/ KEYX	I/O	Input/output pin. Modes 1–7: digital sensor input (SENIN). Mode 0: acts only as KEYx — a digital output (level 0/1) that drives the key matrix for keys 4, 5 and 6.
8	VDD	P	Positive supply voltage.

Configuration Modes (CFG Pins)

Beyond operating as a transmitter with up to 6 keys, the EETX433A can be configured as a magnetic opening sensor (door/window) or a passive PIR motion sensor. Configuration is set by tying pins CFG1, CFG2 and CFG3 to GND (level 0) or VDD (level 1) per the table below:

Pins CFG1, CFG2 and CFG3 are sampled in hardware ONLY at power-up. The binary combination of the three pins (weight CFG3:CFG2:CFG1) selects one of 8 operating modes. Dynamic changes during operation are ignored. The SENIN pin becomes the external sensor input in modes 1–7. See "Functional Operation" for details.

- **Transmitter Mode (Mode 0)** — All three CFG pins are left open during power-up (no connection to VDD/GND) — this selects Mode 0. The IC works as a keypad of up to 6 keys: up to 3 keys wired directly (one per CFG pin) and keys 4, 5 and 6 through control of the KEYx pin (see "Key Mapping" and the 4- and 6-key schematics, Figures 4 and 5). Each key transmits a unique 4-bit value.
- **Magnetic Mode (Modes 1, 2, 3, 6)** — The EETX433A monitors the SENIN pin connected to a magnetic sensor (e.g. TMR, Reed switch). Ideal for door/window opening detection.
- **Passive / PIR Mode (Modes 4, 5, 7)** — The EETX433A monitors the SENIN pin connected to a pyroelectric presence sensor (PIR). Must be a DIGITAL pyrosensor with ON/OFF (high/low) output. Ideal for motion detection.

MODE	TYPE	TRANSMITS	CFG3	CFG2	CFG1	SENIN
0	TRANSMISSOR	TECLA	Aberto	Aberto	Aberto	Aberto
1	MAGNÉTICO	V1B3	0	0	1	Entrada
2	MAGNÉTICO	V3B1	0	1	0	Entrada
3	MAGNÉTICO	A4F5B3	0	1	1	Entrada
4	PASSIVO	V1B3	1	0	0	Entrada
5	PASSIVO	V3B1	1	0	1	Entrada
6	MAGNÉTICO	V2B1	1	1	0	Entrada
7	PASSIVO	V2B1	1	1	1	Entrada

Legend: V = Violation · B = Low battery · A = Open · F = Close. Notation: the number after each letter is the 4-bit value (D3D2D1D0) transmitted in the data field when that event occurs. Example — Mode 1 (V1B3): on a Violation the transmitter sends data = 0001 (= 1); when the sensor reports Low Battery, data = 0011 (= 3) is sent. The receiver decodes the 4-bit field to identify the event. Violation (V) and Open/Close (A/F) are distinct operating modes — a given unit never sends both. In Open/Close modes, Open corresponds to a 0→1 transition of SENIN and Close to a 1→0 transition. Since the frame carries no mode number, interpretation of the 4 bits depends on the unit's configured mode (the same value means different events in different modes); the unique 20-bit address identifies the unit at the receiver.

Block Diagram & Typical Application

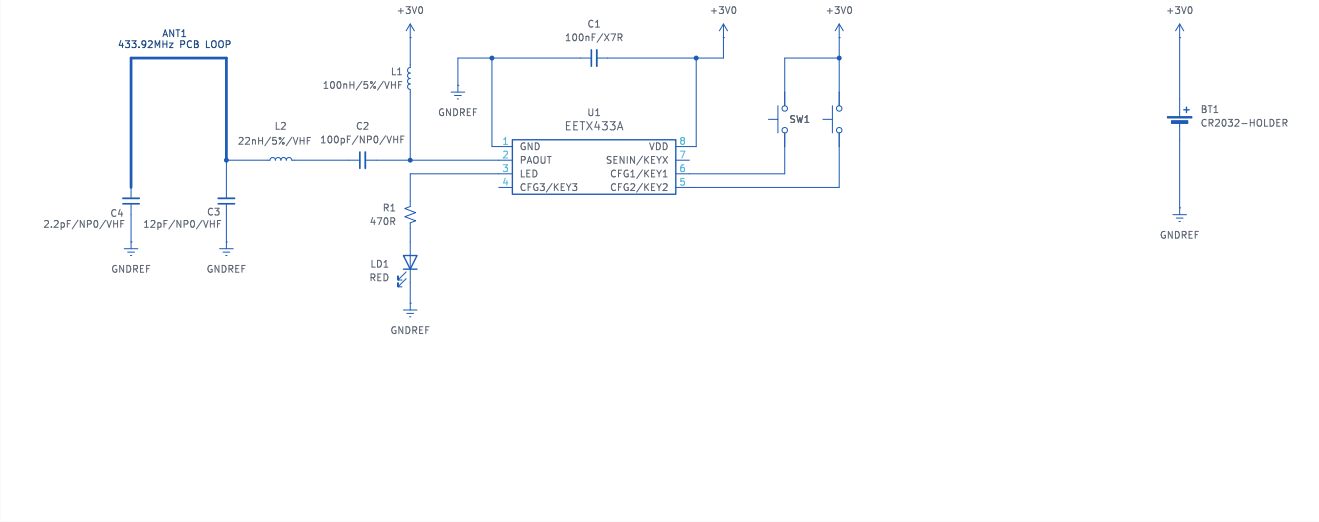


Figure 2: 433.92 MHz typical application — 2 buttons

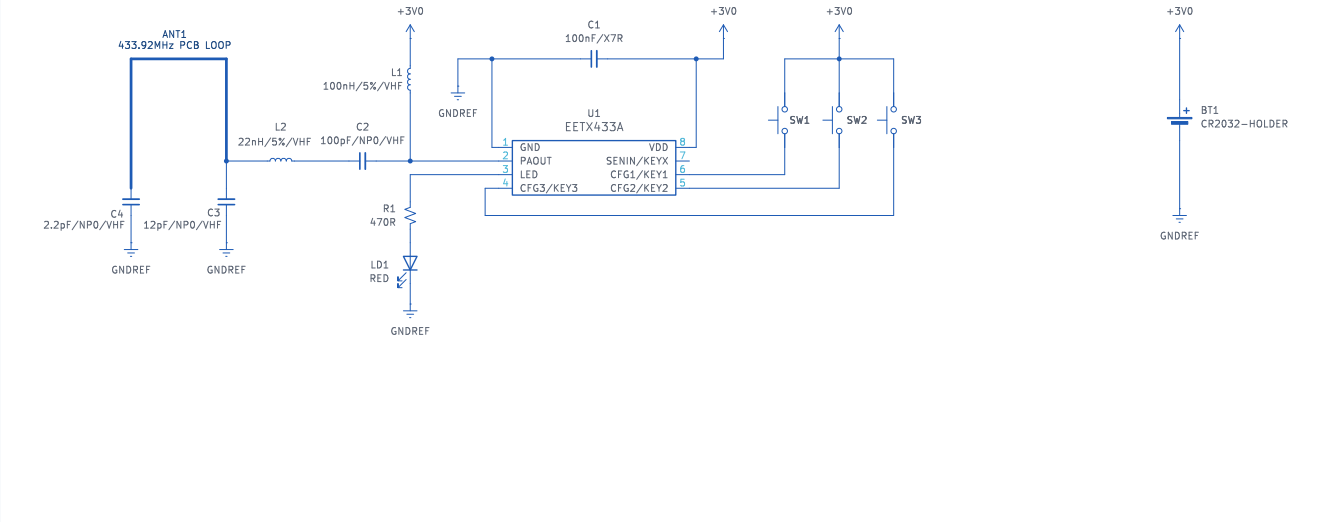


Figure 3: 433.92 MHz typical application — 3 buttons

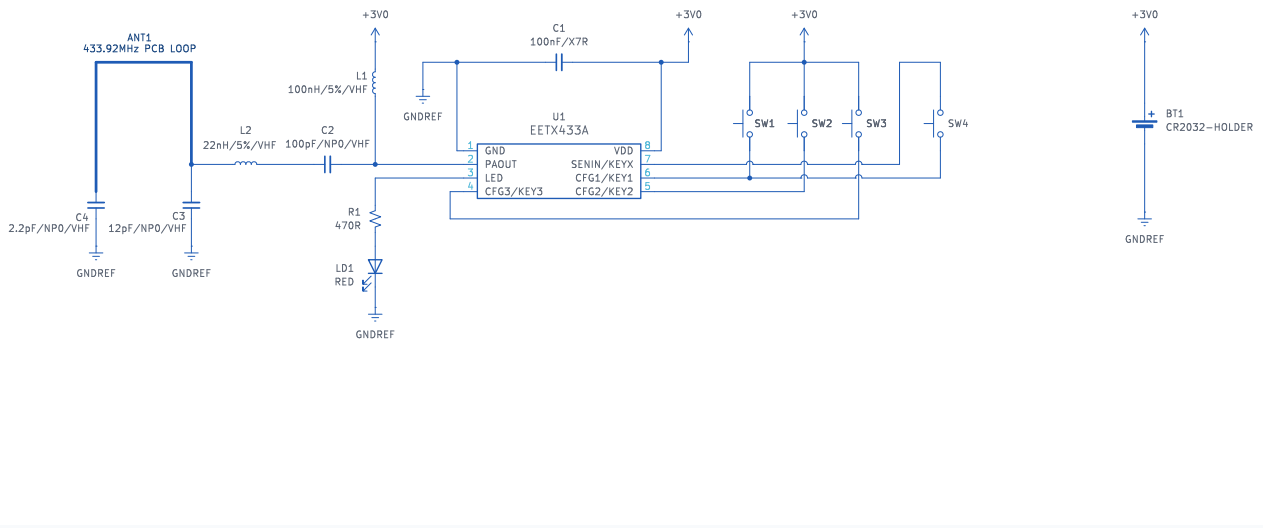


Figure 4: 433.92 MHz typical application — 4 buttons

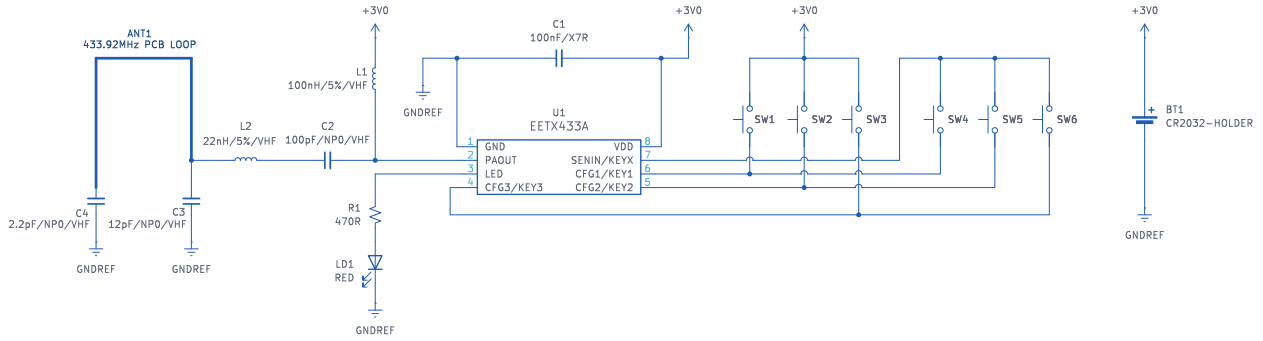


Figure 5: 433.92 MHz typical application — 6 buttons

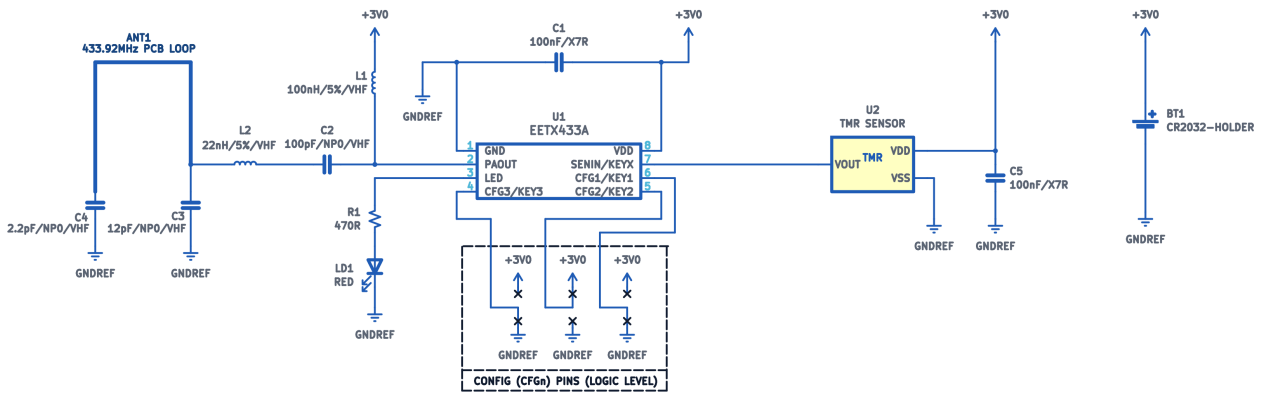


Figure 6: Typical application as magnetic opening sensor (TMR + EETX433A)

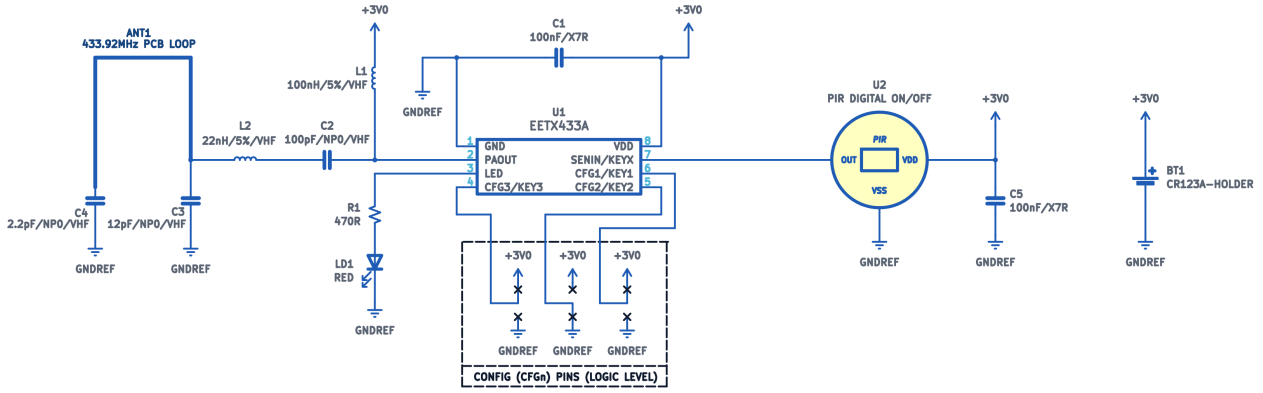


Figure 7: Typical application as motion sensor (digital ON/OFF PIR + EETX433A)

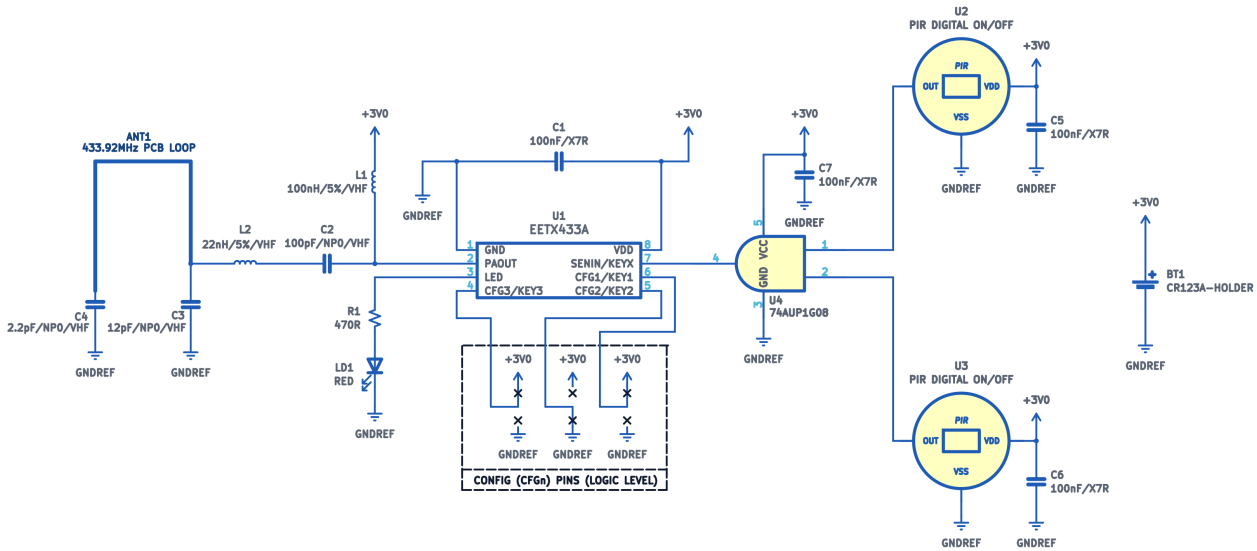


Figure 8: Typical application as dual-lens motion sensor (2× digital PIR + ultra-low-power AND logic gate + EETX433A)

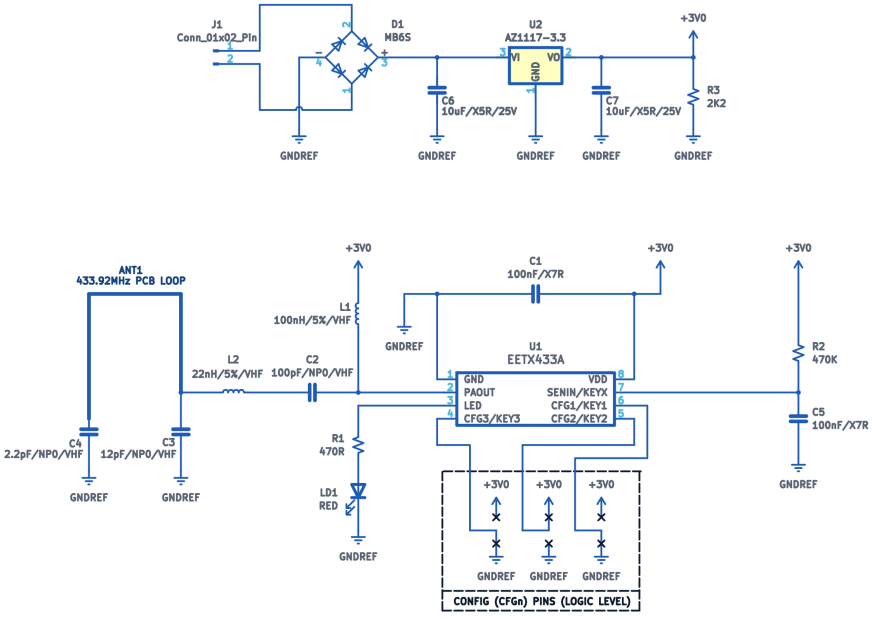


Figure 9: Typical application — transmitter installed on the high-beam headlight (bridge rectifier + 3.3 V LDO + EETX433A)

Data Format

The EETX433A transmits using a pulse-width OOK encoding scheme at 433.92 MHz. Each code word contains a pilot, a start, address, data and an anti-code. The basic time unit (λ) equals 1/3 of the bit period; in the EETX433A, λ = 500 µs, so each bit lasts 1.5 ms. In OOK modulation, a high level = carrier present (carrier-on) and a low level = carrier absent (carrier-off).

In Transmitter mode, transmission triggers when a key connects the KEY pin to VDD (logic 1). In sensor modes (1–7), transmission triggers on the rising edge (0→1) of the SENIN pin. See "Functional Operation" for details.

Packet Structure

Each packet (≈ 54 ms · 108λ) consists of: 23λ pilot (level 0) + 1λ start (level 1) + 20-bit programmable address (60λ) + 4-bit data (D3 D2 D1 D0, 12λ) + 4-bit fixed anti-code 0101 (12λ). The pilot (23λ at level 0, silent) followed by the start (1λ at level 1) synchronises the start of each repeated packet. Each field is transmitted starting from the first bit shown: the address from A0 to A19 and the data from D3 to D0. The 0101 anti-code is fixed and used for validation — the receiver discards the packet if it does not match.

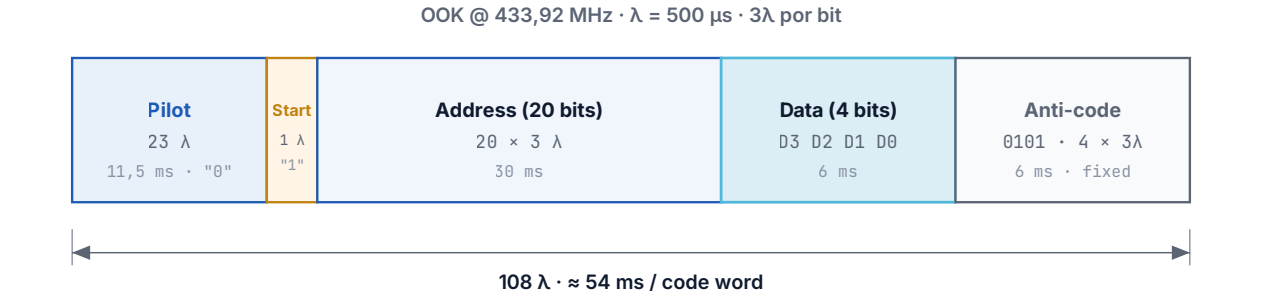


Figure 10: Transmission packet structure

Complete Frame Timing

The diagram below shows the internal fosc clock and the DOUT data line aligned across the phases of the code word. Each address/data/anti-code bit occupies 3λ; the pilot occupies 23λ (level 0), the start 1λ (level 1) and the anti-code 12λ (4 fixed bits 0101).

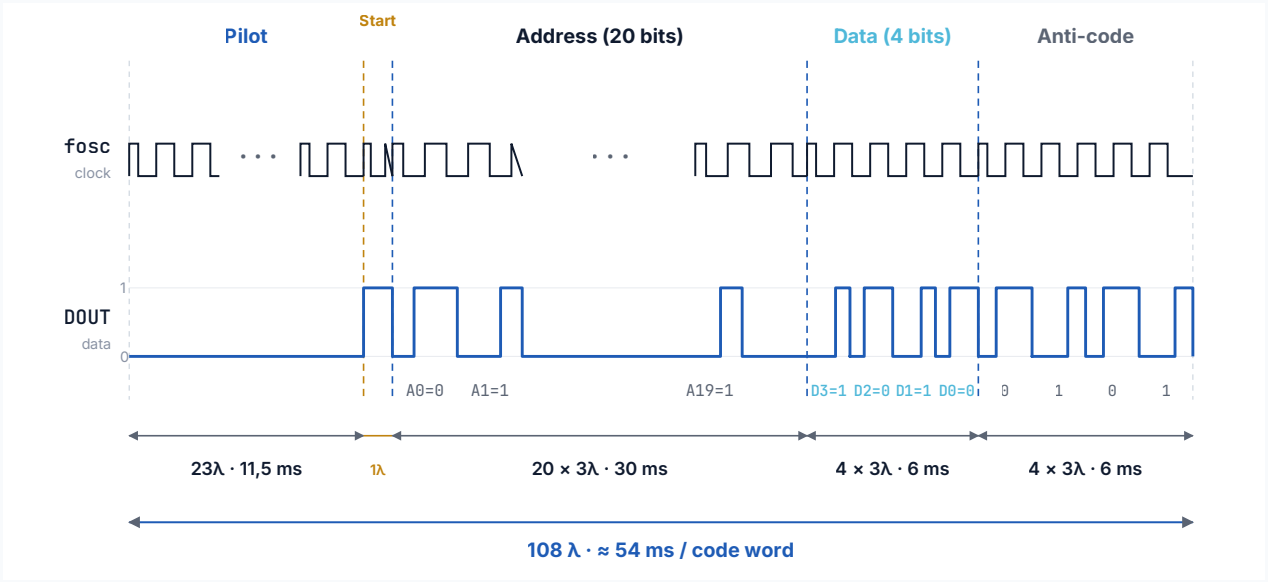


Figure 11: Frame timing — fosc + DOUT (Pilot · Start · Address · Data · Anti-code)

Logic Bit — Waveform

Each address/data bit occupies 3λ (1.5 ms). The logic level is set by the ratio between the low and high times:

- Bit "0": 1λ low + 2λ high (500 µs low / 1000 µs high)
- Bit "1": 2λ low + 1λ high (1000 µs low / 500 µs high)

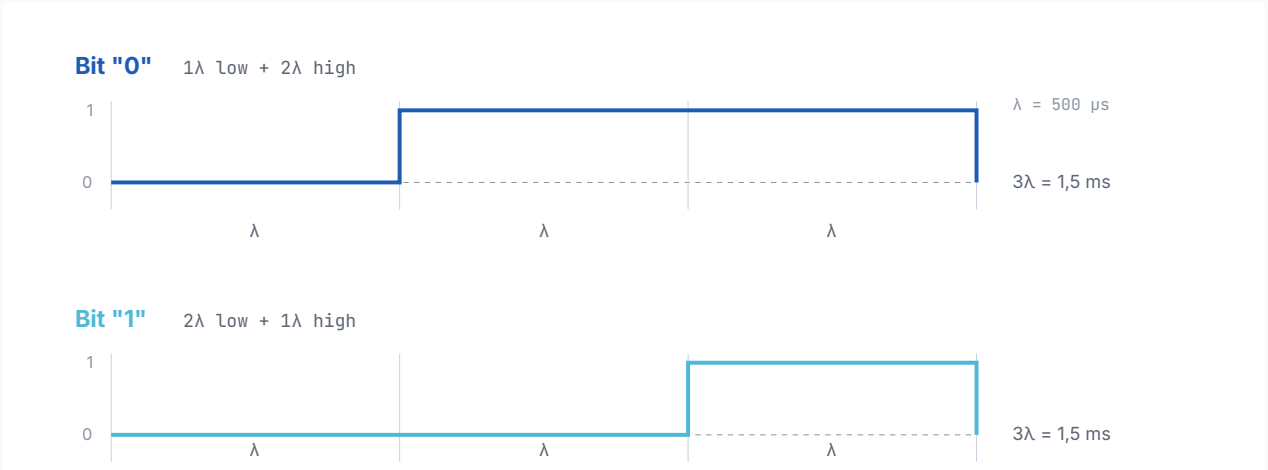


Figure 12: Logic-bit waveforms (OOK modulation)

Characteristic Times

Parameter	Símbolo	Typ.	Unit
Basic unit (λ = 1/3 of bit clock)	λ	500	µs
Bit duration (3λ)	t_BIT	1,5	ms
Pilot (23λ, level 0)	t_PIL	11,5	ms
Start (1λ, level 1)	t_ST	0,5	ms
Address (20 bits)	t_ADDR	30	ms
Data (4 bits)	t_DATA	6	ms
Anti-code (4 bits, 12λ)	t_ANTI	6	ms
Complete packet (typ.)	t_PKT	≈ 54	ms

Functional Operation

This section describes the operational behavior of the EETX433A for designers using the part. All parameters listed below are fixed in the embedded MCU firmware and cannot be altered in production.

Factory-Programmed Address

The 20-bit address is programmed at the factory during EETX433A production and is unique per order code. No additional programming step is required on the customer PCB — the IC is delivered ready-to-use, in a 4 000-piece reel sharing the same address. To order batches with different addresses, contact Engeletron.

Transmission Trigger

Mode 0 (Transmitter): transmission triggers on a key press. Up to 3 keys connect a CFG pin (CFG1, CFG2 or CFG3) directly to VDD (logic 1); keys 4, 5 and 6 use control of the KEYx pin (SENIN/KEYx) — see "Key Mapping" and Figures 4 and 5. Transmission continues while the key is held, with a minimum duration of 864 ms (16 packets) and a maximum of 5400 ms (100 packets). If the user releases the key before 864 ms, the IC still completes the minimum duration.

Modes 1–7 (Sensor): transmission triggers on the rising edge (0 → 1 transition) of the SENIN pin, coming from a digital sensor with ON/OFF output (magnetic TMR or digital PIR sensor). Transmission duration is fixed at 1 296 ms (24 packets) regardless of the sensor state after the trigger.

PIR Mode Re-arming (Motion)

In PIR (Passive) modes, after a transmission the IC enters a lockout state until the sensor remains at logic low (no motion detected) for at least 120 seconds (2 minutes) continuously. This interval prevents transmission bursts in environments with continuous motion (e.g. wind-blown curtains). Only after this idle period will the IC accept a new SENIN rising edge and trigger a new transmission.

Low-Battery Detection (sensor modes 1–7)

In sensor modes (1–7), the EETX433A continuously monitors the supply voltage. When VDD falls below ≈ 2.2 V (falling threshold 2.20 V; re-arm when VDD rises above ≈ 2.23 V — hysteresis ≈ 30 mV; tolerance ±0.1 V), the device starts signaling the Low-Battery event, transmitted in the 4-bit data field as the "B" code in the modes table "TRANSMITS" column. This lets the receiver alert the user to replace the battery. Low-battery detection does not apply to Mode 0 (Transmitter).

CFG Pin Sampling

CFG1, CFG2 and CFG3 pins are sampled ONLY at power-up (VDD ramp from 0 V to the operating level). Dynamic changes during operation are ignored. After the latch (≤ 1 ms), the same pins become KEY1/KEY2/KEY3 (mode 0) or are reserved for internal use (modes 1–7). Important: in Mode 0, do not power up the device with a key pressed — that would tie a CFG pin to VDD during power-up and select an unintended sensor mode. Make sure all keys are released when power is applied (e.g., when inserting the battery). During power-up, do not apply any level to CFG1/CFG2/CFG3 or to KEYx (SENIN/KEYx) — leaving them undriven is what guarantees entry into Mode 0.

Key Mapping (Mode 0)

In Mode 0 (Transmitter), CFG1, CFG2 and CFG3 must be left floating (no connection to VDD or GND) at power-up — this is what selects Mode 0. Only 3 keys can be wired directly, one per CFG pin, tying the pin to VDD when pressed: KEY1 → CFG1/KEY1 (pin 6), KEY2 → CFG2/KEY2 (pin 5) and KEY3 → CFG3/KEY3 (pin 4). Keys 4, 5 and 6 are not direct: they rely on control of the KEYx pin (SENIN/KEYx), per the 4- and 6-key application schematics (see Figures 4 and 5). Each key transmits a fixed 4-bit value per the table below:

Key	D3	D2	D1	D0	Decimal value
KEY1	0	0	0	1	1
KEY2	0	0	1	0	2
KEY3	0	0	1	1	3
KEY4	0	1	0	0	4
KEY5	0	1	0	1	5
KEY6	0	1	1	0	6

SENIN Pin (Sensor Input)

In modes 1–7, the SENIN pin operates as a pure digital input (high impedance). There is no internal pull-up or pull-down: the connected sensor is responsible for maintaining the defined logic level (high or low) under all operating conditions. Sensors with push-pull outputs (e.g. digital TMR, ON/OFF digital PIR) meet this requirement without additional components. For open-drain output sensors or dry contacts, use an external pull-down resistor (typical 100 kΩ → GND) to guarantee a defined low level at rest.

Operational Timing Parameters

Parameter	Symbol	Min.	Typ.	Max.	Unit
Tempo de wake-up (power-up até 1º bit)	t_WK	—	50	100	ms
Tempo de estabilização do PLL	t_PLL	—	0,2	1	ms
Duração de 1 pacote (108λ)	t_PKT	—	54	—	ms
Modo 0 — TX mínimo (16 pacotes)	t_TX0_min	—	864	—	ms
Modo 0 — TX máximo (100 pacotes)	t_TX0_max	—	—	5400	ms
Modos 1–7 — TX fixo (24 pacotes)	t_TX1_7	—	1296	—	ms
Rearme PIR — sem movimento contínuo	t_REARM	120	—	—	s
Latch dos pinos CFG (power-up)	t_CFG	—	—	1	ms

Compatible Receiver

To receive and decode the signal transmitted by the EETX433A, an ASK (Amplitude Shift Keying) RF receiver with a reception bandwidth (Δf_RX) of ±300 kHz or higher is recommended — comfortably covering the ±250 kHz unit-to-unit f_o variation of the EETX433A. Recommended sensitivity is -110 dBm to -112 dBm for typical residential/commercial range. Frame decoding (23λ pilot + 1λ start + 20-bit address + 4-bit data + 4-bit anti-code 0101, λ = 500 µs) is typically performed by a microcontroller on the receiver side.

Electrical Characteristics

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
VDD	V_DD	-0.3	3.6	V
TJ	T_J	-40	150	°C
TSTG	T_STG	-50	150	°C
ESD (HBM)	V_ESD	—	±5	kV

Recommended Operating Conditions

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
VDD	V_DD		2.0	3.3	3.6	V
Ta	T_a		-40	25	85	°C
RL	R_L			50		Ω

DC Characteristics

V_{SS}=0V, V_{DD}=3V, T_a=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
VDD	V_DD		2.0	3.3	3.6	V
IDD	I_DD	13dBm	8	12	14	mA
ISD	I_SD	no key pressed	700	800	900	nA

Analog / RF Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Po (433M)	P_O	RL=50Ω, VDD=3V		13		dBm
Po (433M)	P_O	RL=50Ω, VDD=3.6V		14		dBm
Δf entre unidades	Δf_unit	VDD=3V, Ta=25°C, unit-to-unit		±200	±250	kHz

Soldering Guidelines

The EETX433A is MSL-3 rated (J-STD-020) and withstands standard lead-free reflow soldering. Even so, do not exceed the recommended profile: excessive heat can cause thermal-deformation damage. Use a non-corrosive rosin-type flux and observe the moisture-sensitivity level (MSL-3) before soldering.

1. Hand soldering (test samples)

- Use a 30 W soldering iron with tip temperature 260–300 °C.
- Maximum contact time: 5 seconds.
- Keep the tip thoroughly clean.

2. Reflow soldering (SMT)

Excess temperature can damage the EETX433A, causing thermal deformation of the package and a shift of the 433.92 MHz frequency. Use low-temperature solder-paste alloys and do NOT exceed a 210 °C peak for at most 10 s. Recommended alloy: SnBi — Sn42Bi57Ag1 (180 °C peak, lead-free / RoHS); the SnPb — Sn63Pb37 alloy (210 °C peak) is only the absolute maximum limit. Ramp-up ~1.2–1.4 °C/s, ramp-down ≤ 3–4 °C/s and a maximum of 2 reflow cycles. See the curve and phase table below.

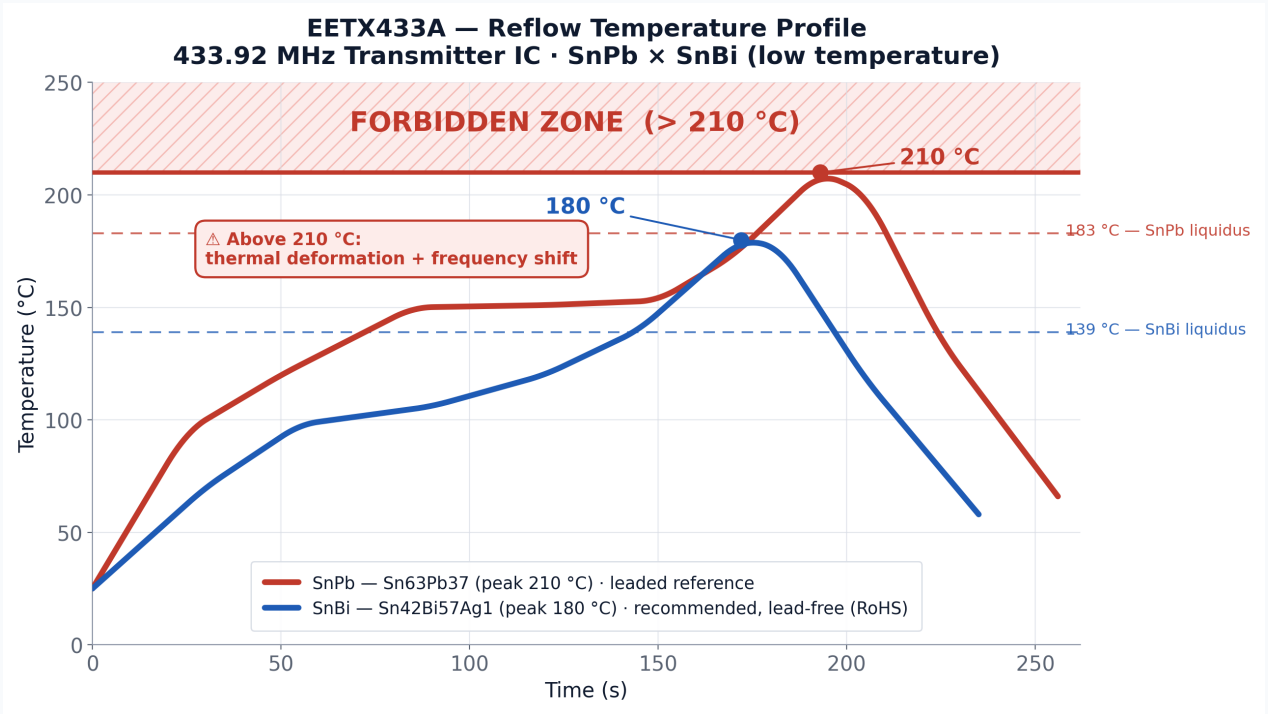


Figure 13: Recommended reflow temperature profile

Phase	SnPb · t (s)	SnPb · T (°C)	SnBi · t (s)	SnBi · T (°C)
Ramp-up	0–90	25→150	0–60	25→100
Preheat (soak)	90–150	~150	60–120	100→120
Ramp to peak	150–190	150→210	120–170	120→180
Peak (reflow)	190–200	210 (≤10 s)	170–180	180
Cooling	200–255	210→70	180–235	180→60

SnBi (Sn42Bi57Ag1, lead-free, RoHS) — recommended. SnPb (Sn63Pb37) is the leaded reference; 210 °C is the absolute maximum limit. Ramp-up ~1.2–1.4 °C/s · cooling ≤ 3–4 °C/s · max. 2 reflow cycles. Hand soldering (samples): tip ≤ 300 °C, contact ≤ 5 s.

Package Information

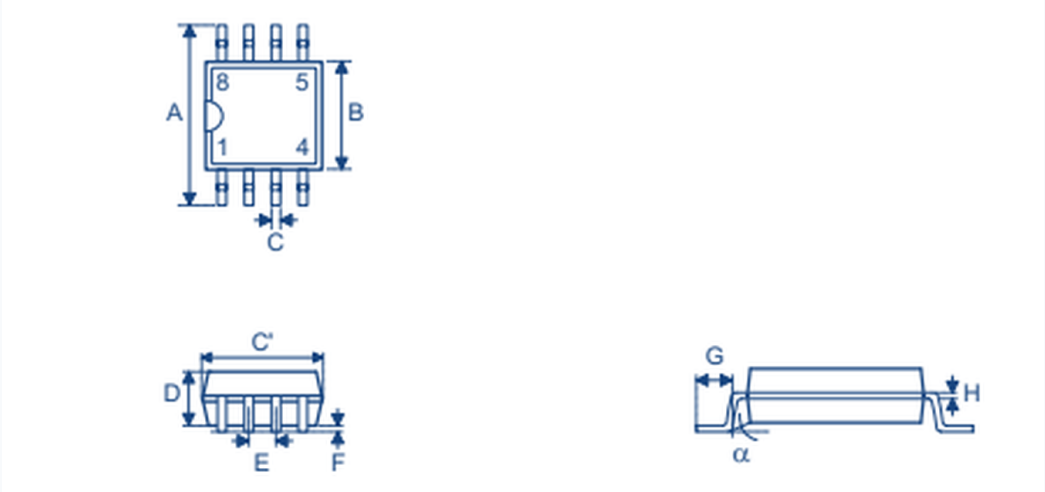


Figure 14: SOP-8 package — mechanical drawing

Symbol	Min (mil)	Nom (mil)	Max (mil)
A	228	—	244
B	149	—	157
C	14	—	20
C'	189	—	197
D	53	—	69
E	—	50	—
F	4	—	10
G	22	—	28
H	4	—	12
α	0°	—	10°

Packaging (Tape & Reel)

The EETX433A is supplied in carrier tape wound on a standard 330 mm reel, fully compatible with SMT pick-and-place systems.

STANDARD QUANTITY

4 000 pieces per reel

Collective packaging: 1 reel + identification card + sealed anti-static bag, per MSL-3 / J-STD-020.

Reel Dimensions — SOP-8

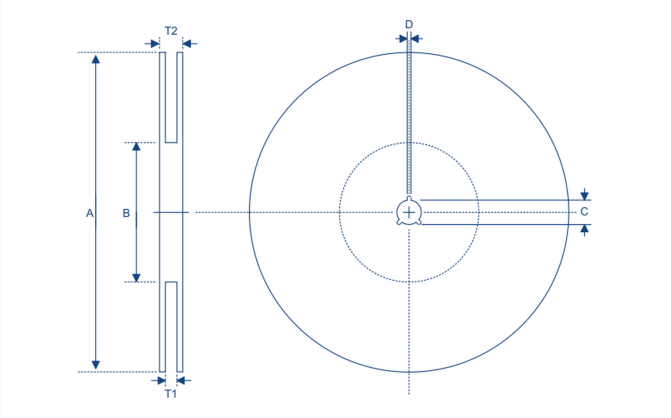


Figure 15: Standard 330 mm reel — 4 000 pcs

Symbol	Description	Dimension (mm)
A	Diâmetro externo do rolo / Reel outer diameter	330 ±1,0
B	Diâmetro interno do rolo / Reel inner diameter	62 ±1,5
C	Diâmetro do furo central / Spindle hole diameter	13,0 +0,5 / -0,2
D	Largura do entalhe-chave / Key slit width	2,0 ±0,15
T1	Espaço entre flanges / Space between flanges	12,8 +0,3 / -0,2
T2	Espessura total do rolo / Reel thickness	18,2 ±0,2

Carrier Tape Dimensions — SOP-8

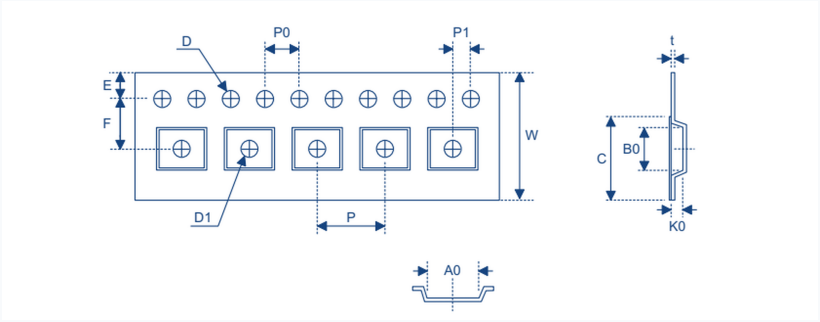


Figure 16: 12 mm carrier tape

Symbol	Description	Dimension (mm)
W	Largura da fita / Carrier tape width	12,0 +0,3 / -0,1
P	Passo dos compartimentos / Cavity pitch	8,0 ±0,1
E	Posição da perfuração / Perforation position	1,75 ±0,1
F	Cavidade → perfuração (largura) / Cavity to perf	5,5 ±0,1
D	Diâmetro da perfuração / Perforation diameter	1,55 ±0,1
D1	Diâmetro do furo da cavidade / Cavity hole diameter	1,5 +0,25
P0	Passo da perfuração / Perforation pitch	4,0 ±0,1
P1	Cavidade → perfuração (comprimento)	2,0 ±0,1
A0	Comprimento da cavidade / Cavity length	6,4 ±0,1
B0	Largura da cavidade / Cavity width	5,20 ±0,1
K0	Profundidade da cavidade / Cavity depth	2,1 ±0,1
t	Espessura da fita / Carrier tape thickness	0,3 ±0,05
C	Largura da fita de cobertura / Cover tape width	9,3

For more information about this product, visit: **https://engeletron.com.br/**