We consider all elements x that fulfill the following relation

$$x = x$$

Trivially, all sets fulfill this relation. The question arises, if there exists a set that contains all these elements. In other words:
Is $\{x : \; x = x\}$ a set?
If yes, then this set would contain all sets, since each set fulfills $x = x$. Let us assume it is a set and denote it by X. Define

$$y := \{z \in X \; : \; z \notin z\}$$

By axioms of set-theory, this is a set and moreover either $y \in y$ or $y \notin y$. If $y \in y$, then since $y \in X$ the definition of y implies $y \notin y$. So it must be $y \notin y$. But then, the definition of y implies $y \in y$.
All in all, this yields a contradiction and thus X cannot be a set.

Although it is not a set, it still makes perfectly sense, in terms of propositional logic, to consider expressions of the form

$$\{x \; : \; \phi(x)\}$$

where ϕ is any formula. Though, we must take in mind that the expression does not always refer to a set. In such cases they are called (proper) classes.