MODULE *Channel*

EXTENDS *Naturals*
CONSTANT *Data*
VARIABLE *chan*

$$TypeInvariant \triangleq chan \in [val : Data,\ \ rdy : \{0, 1\},\ \ ack : \{0, 1\}]$$

$$Init \triangleq \land\ TypeInvariant \\ \land\ chan.ack = chan.rdy$$

$$Send(d) \triangleq \land\ chan.rdy = chan.ack \\ \land\ chan' = [chan \text{ EXCEPT } !.val = d,\ !.rdy = 1 - @]$$

$$Rcv \triangleq \land\ chan.rdy \neq chan.ack \\ \land\ chan' = [chan \text{ EXCEPT } !.ack = 1 - @]$$

$$Next \triangleq (\exists\, d \in Data : Send(d)) \lor Rcv$$

$$Spec \triangleq Init \land \Box[Next]_{chan} \land \mathrm{WF}_{chan}(Rcv)$$ Adding liveness property

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THEOREM $Spec \Rightarrow \Box\, TypeInvariant$