

# **Soft USB Design Challenges**



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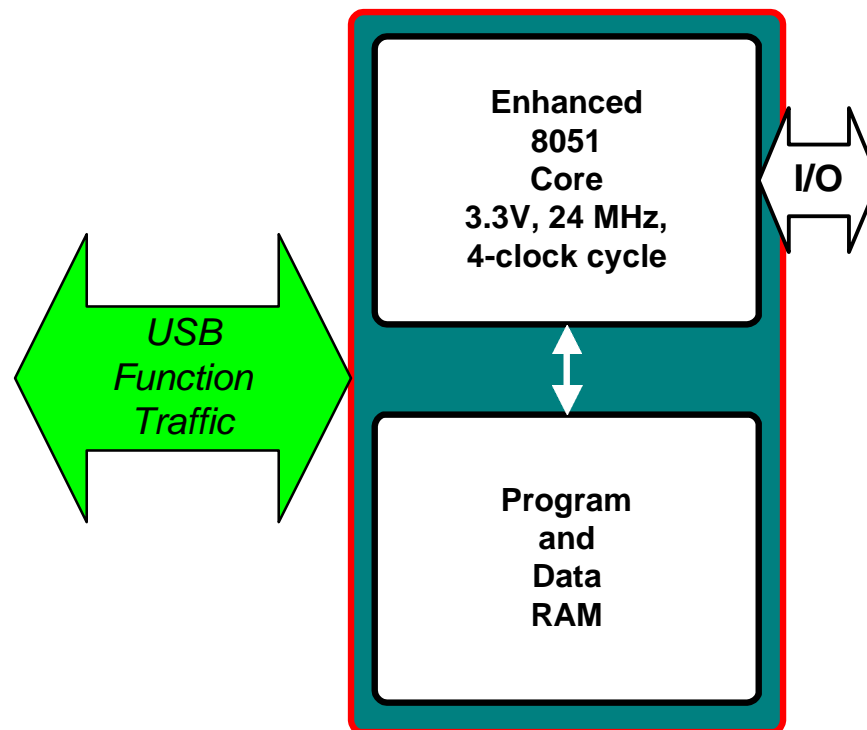
# Soft USB Design Challenges

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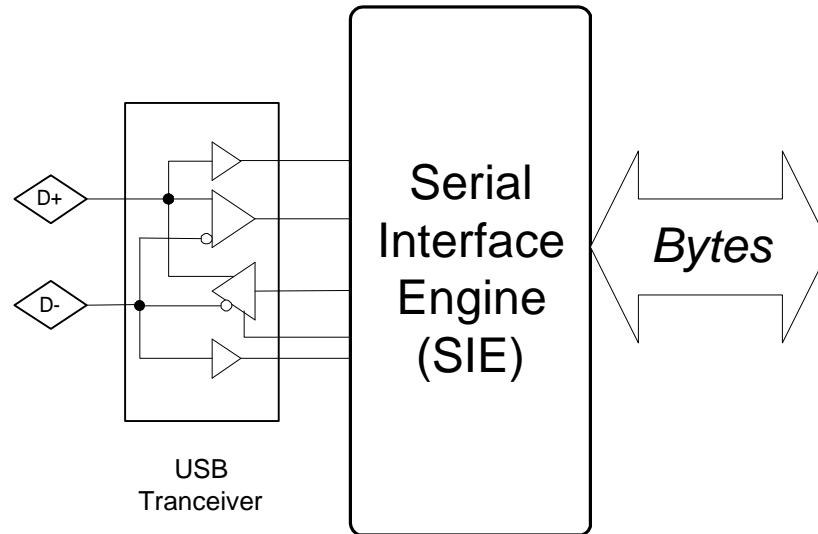


# The Objective: ***SOFT***



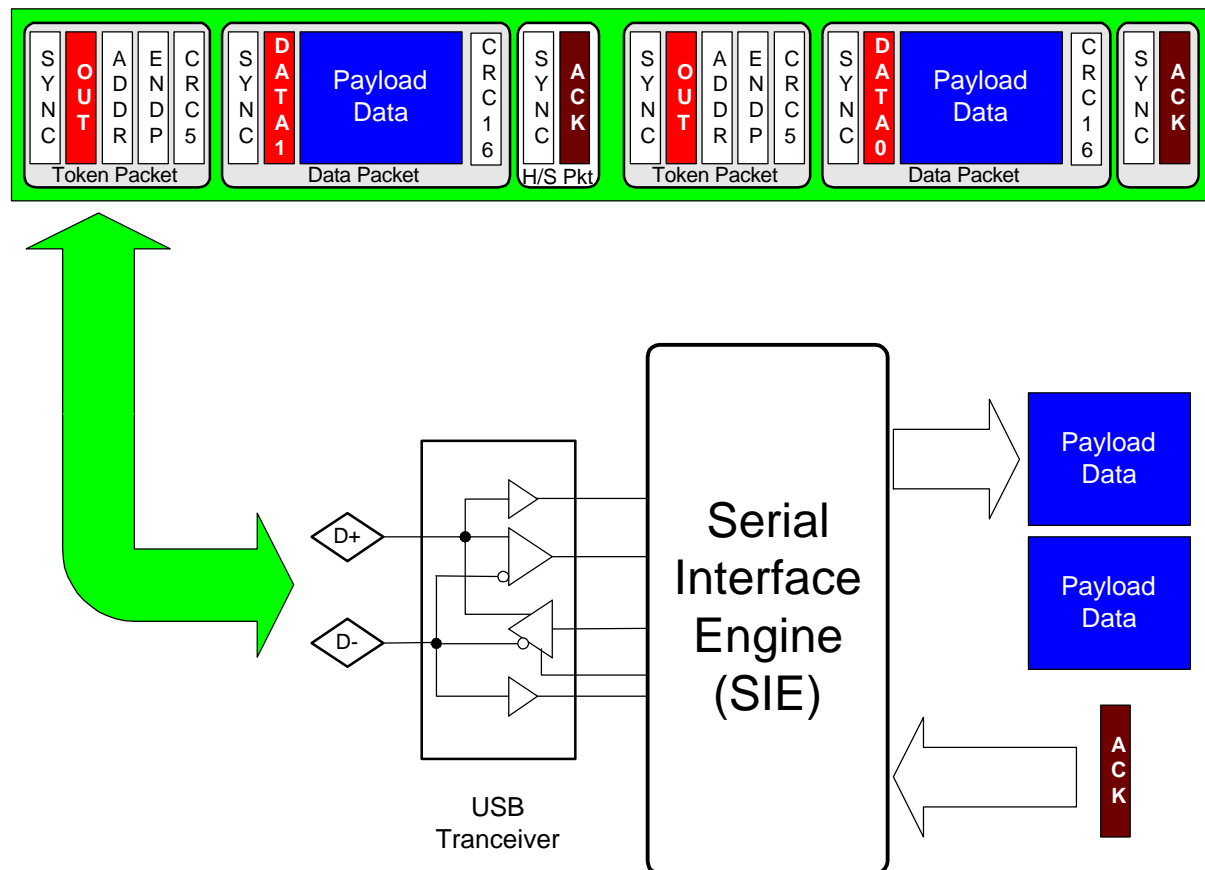


# The Basic USB Interface



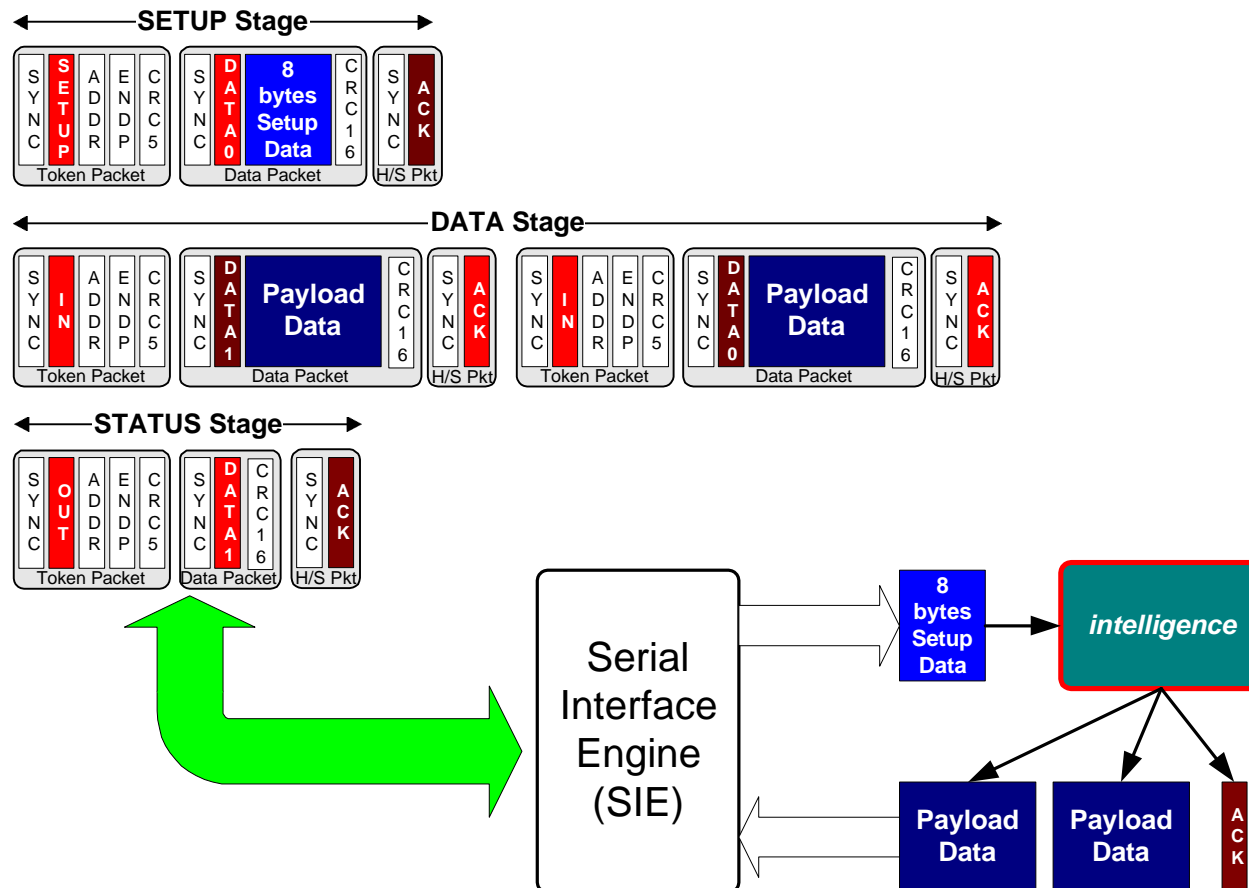


# What the SIE Does



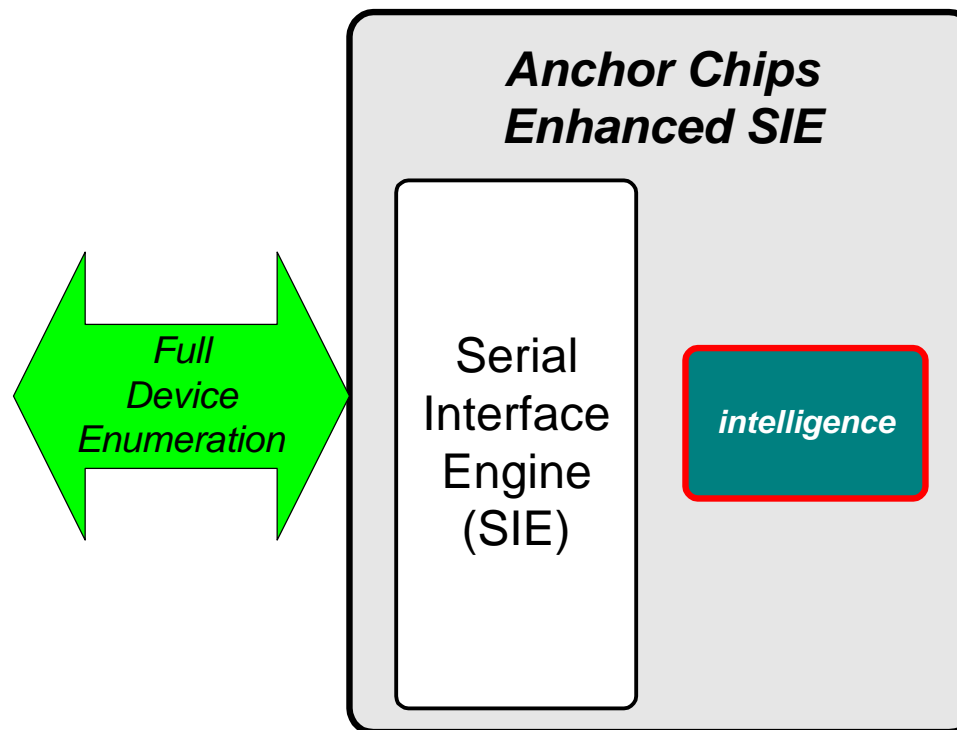


# A USB Control Transfer





# EZ-USB Enhanced SIE



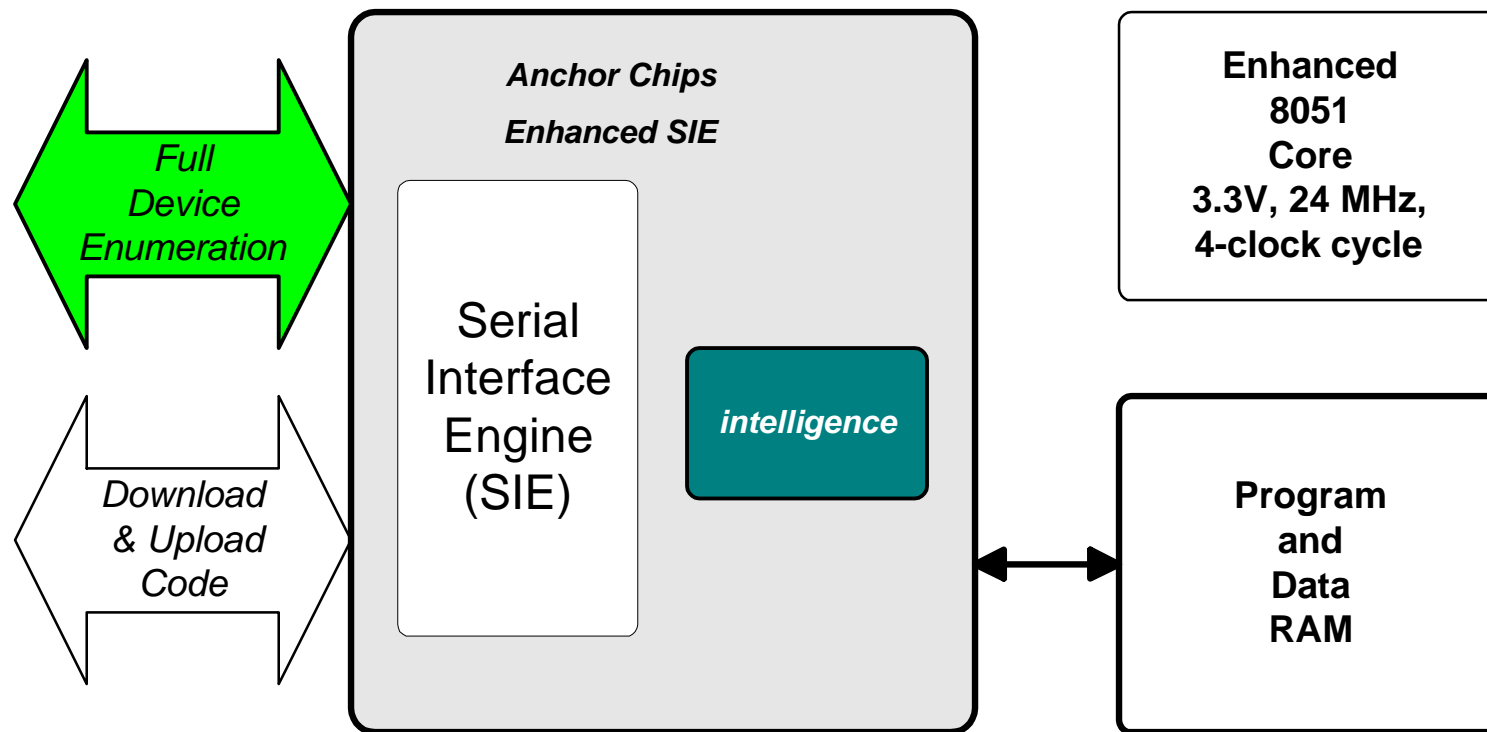


# Default Endpoints

Endpoint	Type	Alternate Setting		
		0	1	2
		Max Packet Size (bytes)		
0	CTL	64	64	64
1 IN	INT	0	16	64
2 IN	BULK	0	64	64
2 OUT	BULK	0	64	64
4 IN	BULK	0	64	64
4 OUT	BULK	0	64	64
6 IN	BULK	0	64	64
6 OUT	BULK	0	64	64
8 IN	ISO	0	16	256
8 OUT	ISO	0	16	256
9 IN	ISO	0	16	16
9 OUT	ISO	0	16	16
10 IN	ISO	0	16	16
10 OUT	ISO	0	16	16



# Advanced SIE Enumerates & Loads Code



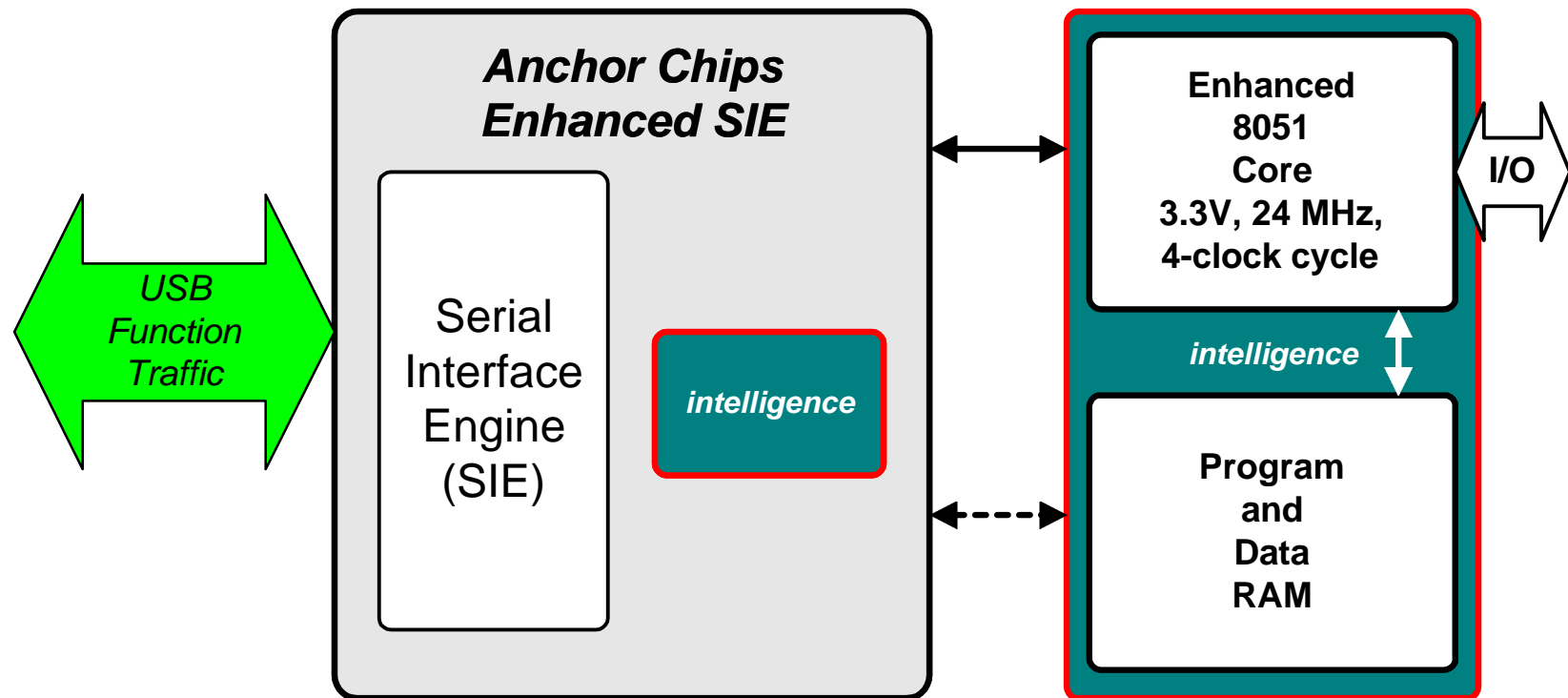


# The Download Request

Byte	Field	Value	Meaning
0	bmRequest	<b>0x40</b>	Vendor Request, OUT
1	bRequest	<b>0xA0</b>	“Anchor Load”
2	wValueL	<b>AddrL</b>	Starting address
3	wValueH	<b>AddrH</b>	
4	wIndexL	0x00	
5	wIndexH	0x00	
6	wLengthL	<b>LenL</b>	Number of Bytes
7	wLengthH	<b>LenH</b>	

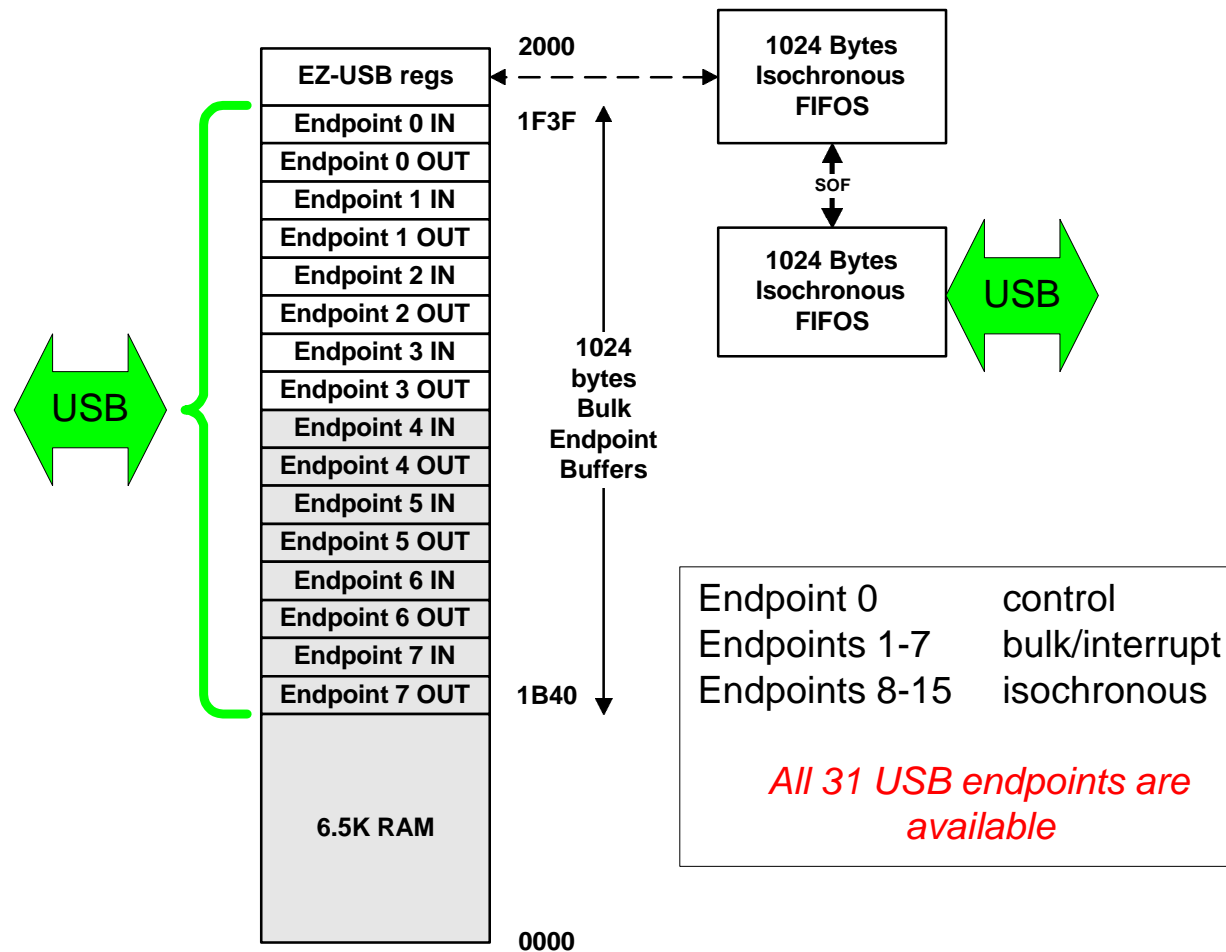


# Final USB Device



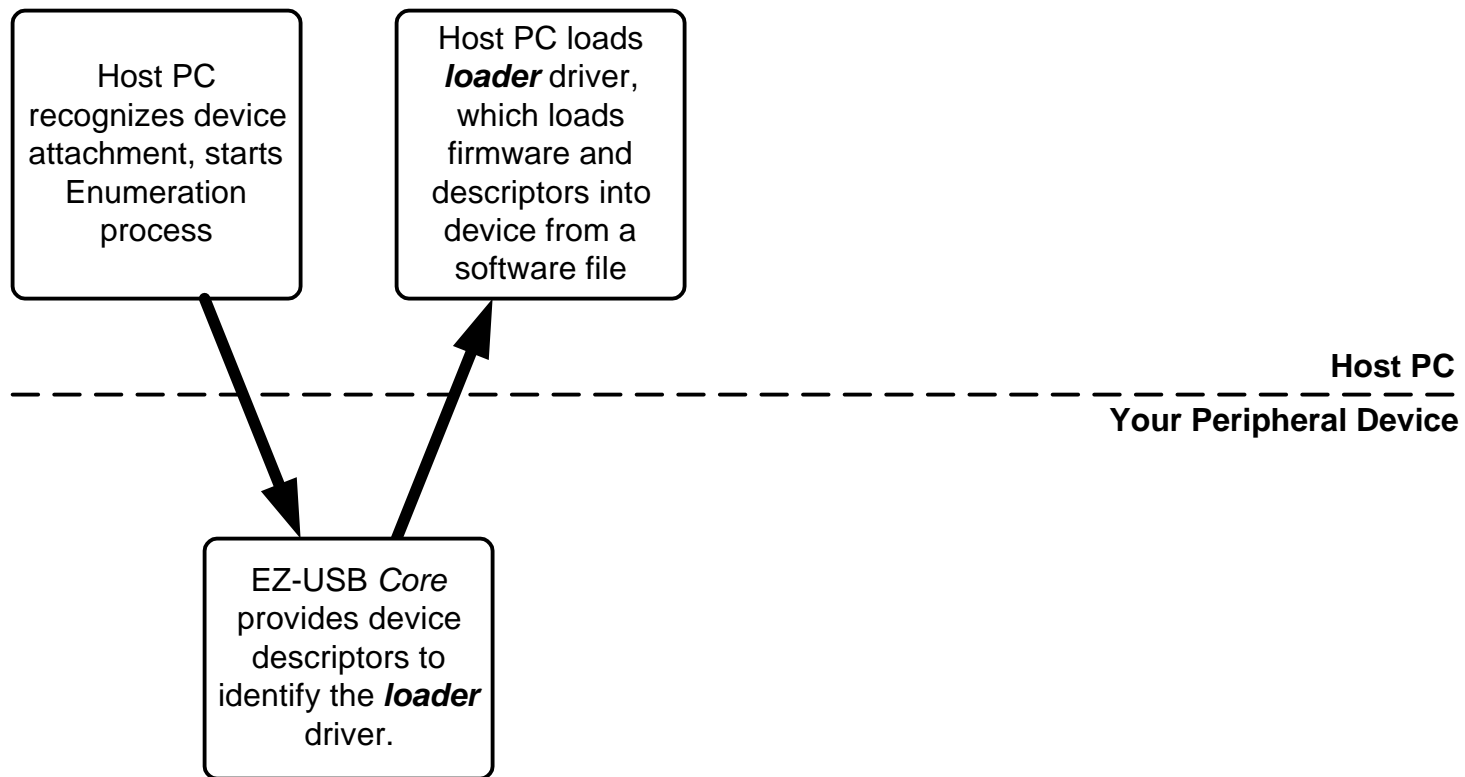


# AN2131Q Memory Map



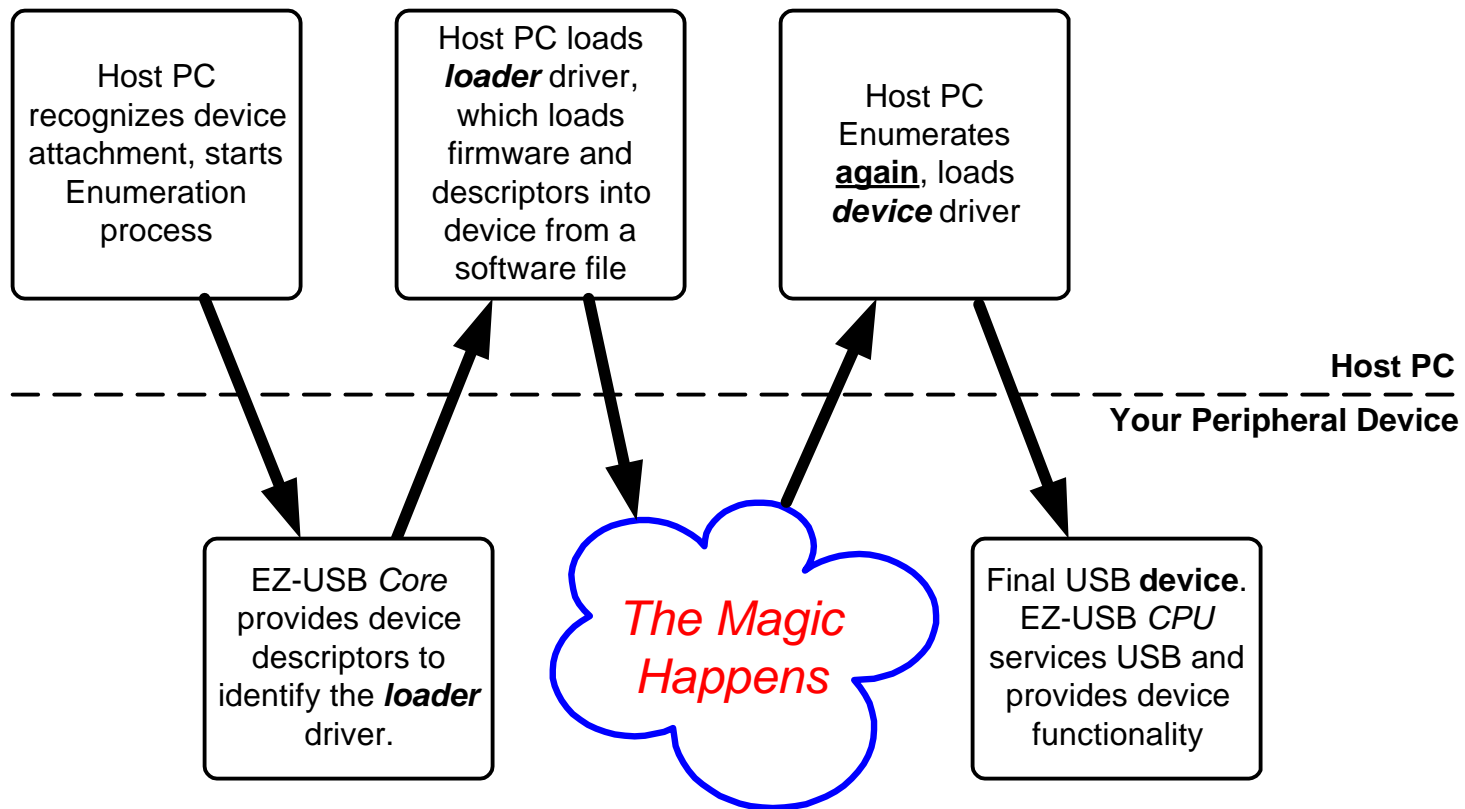


# Enumeration



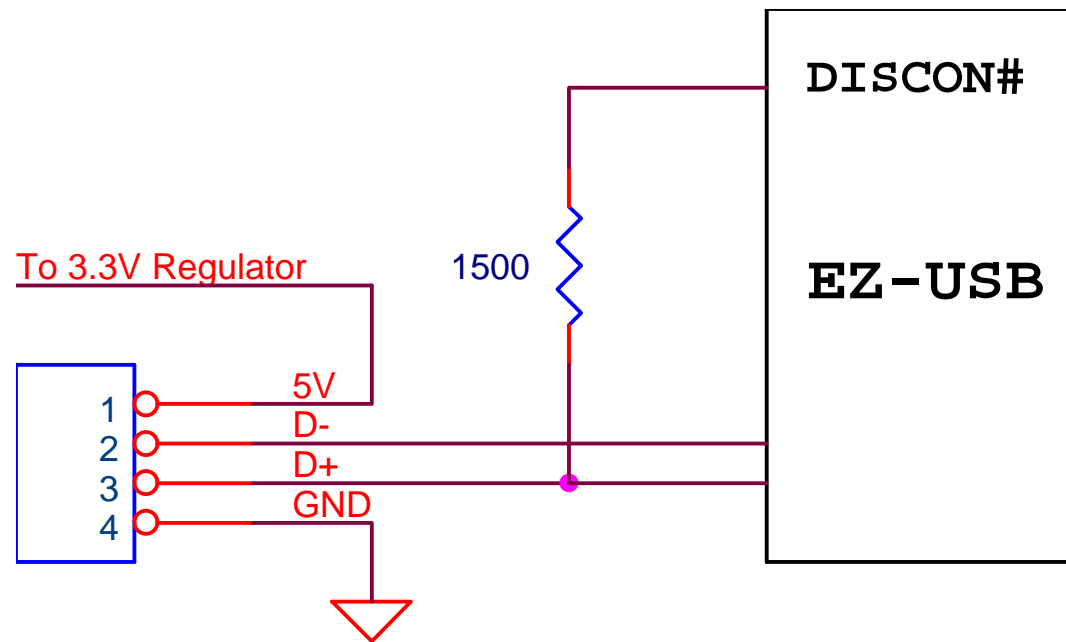


# The ReNumeration™ Process



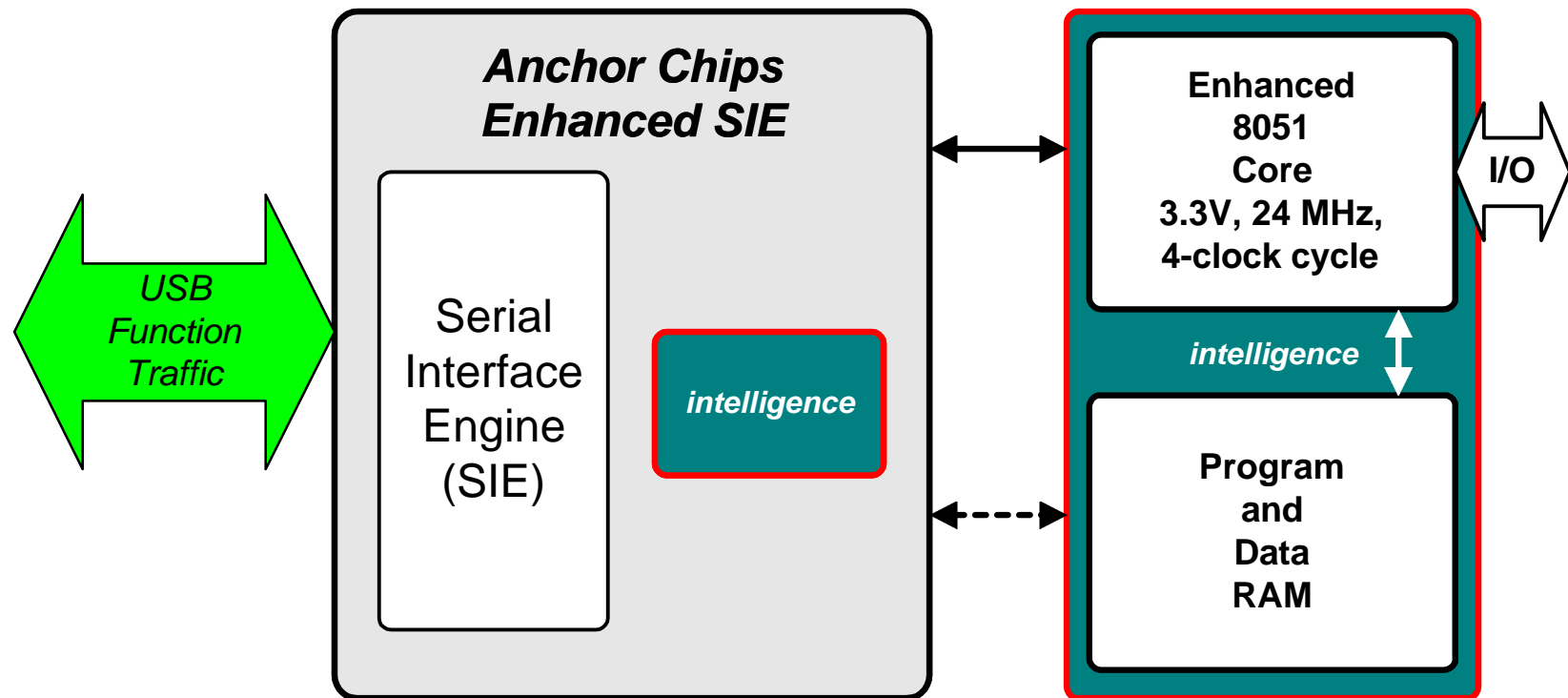


# Emulating a Physical Disconnect



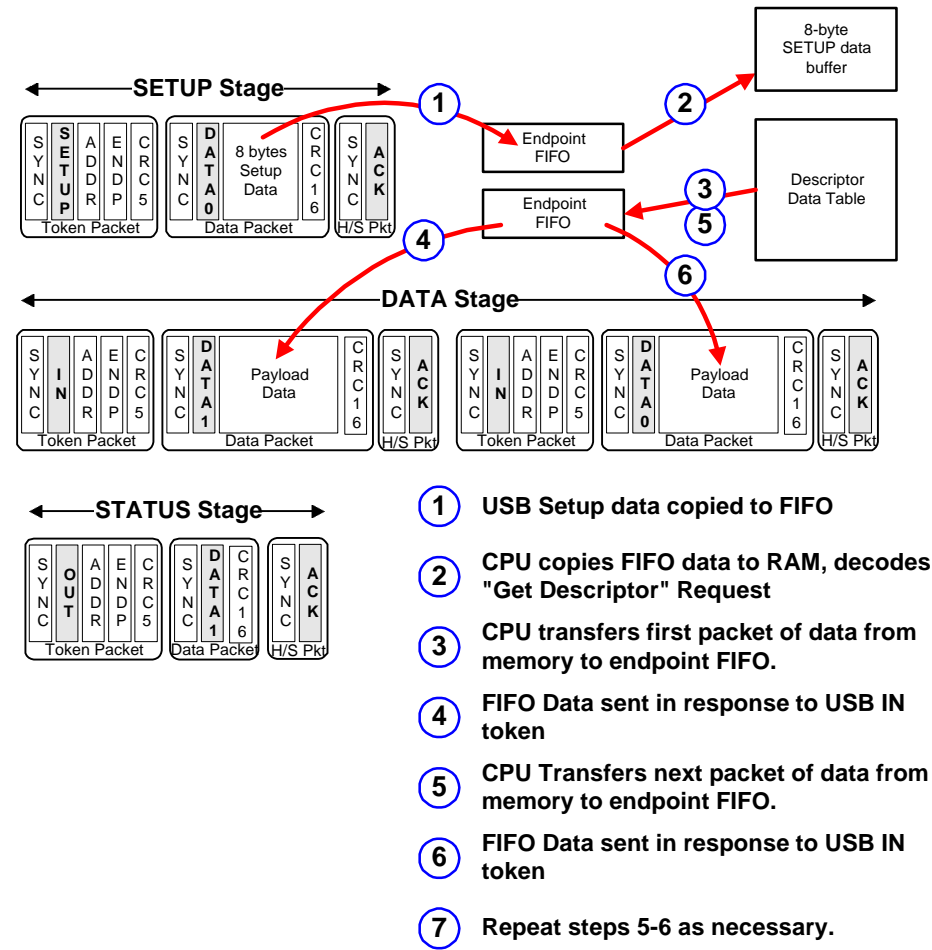


# Using the Enhanced SIE



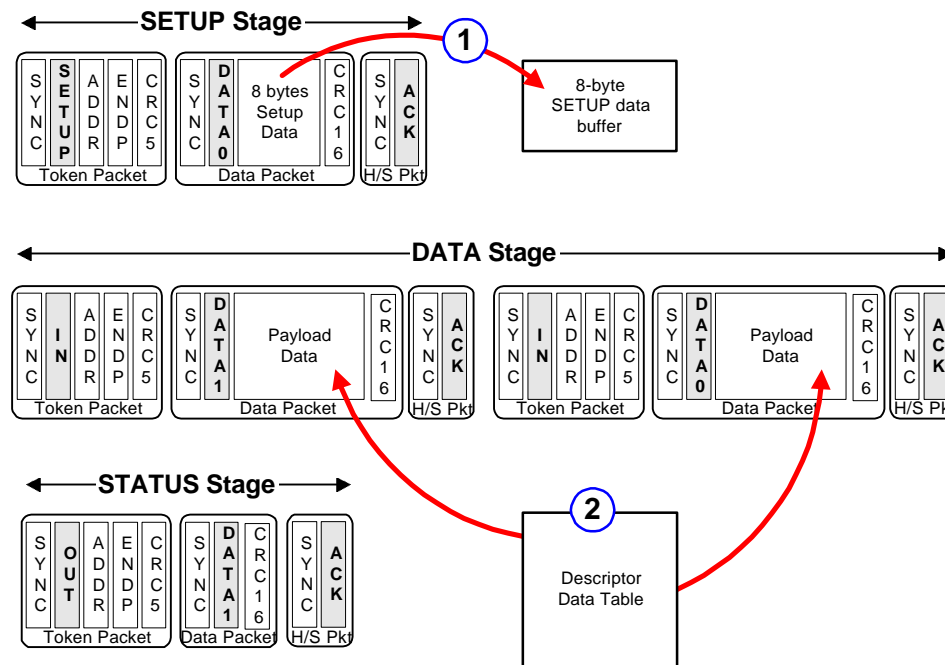


# Get Descriptor--Without Enhanced SIE





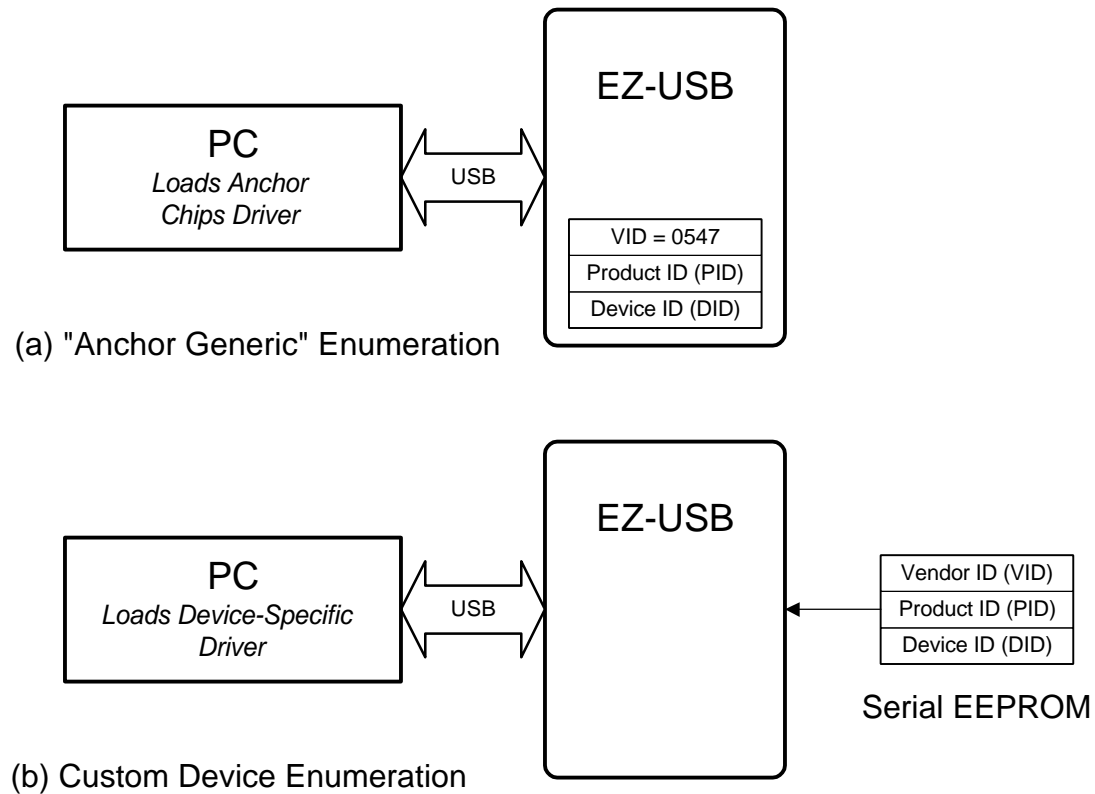
# Get Descriptor--With Enhanced SIE



- 1 EZ-USB core copies Setup data directly to RAM, eliminating the FIFO-to-RAM copy step. 8051 decodes the "Get Descriptor" request.
- 2 8051 sets pointer to descriptor table in RAM, EZ-USB core does entire multi-packet transfer.

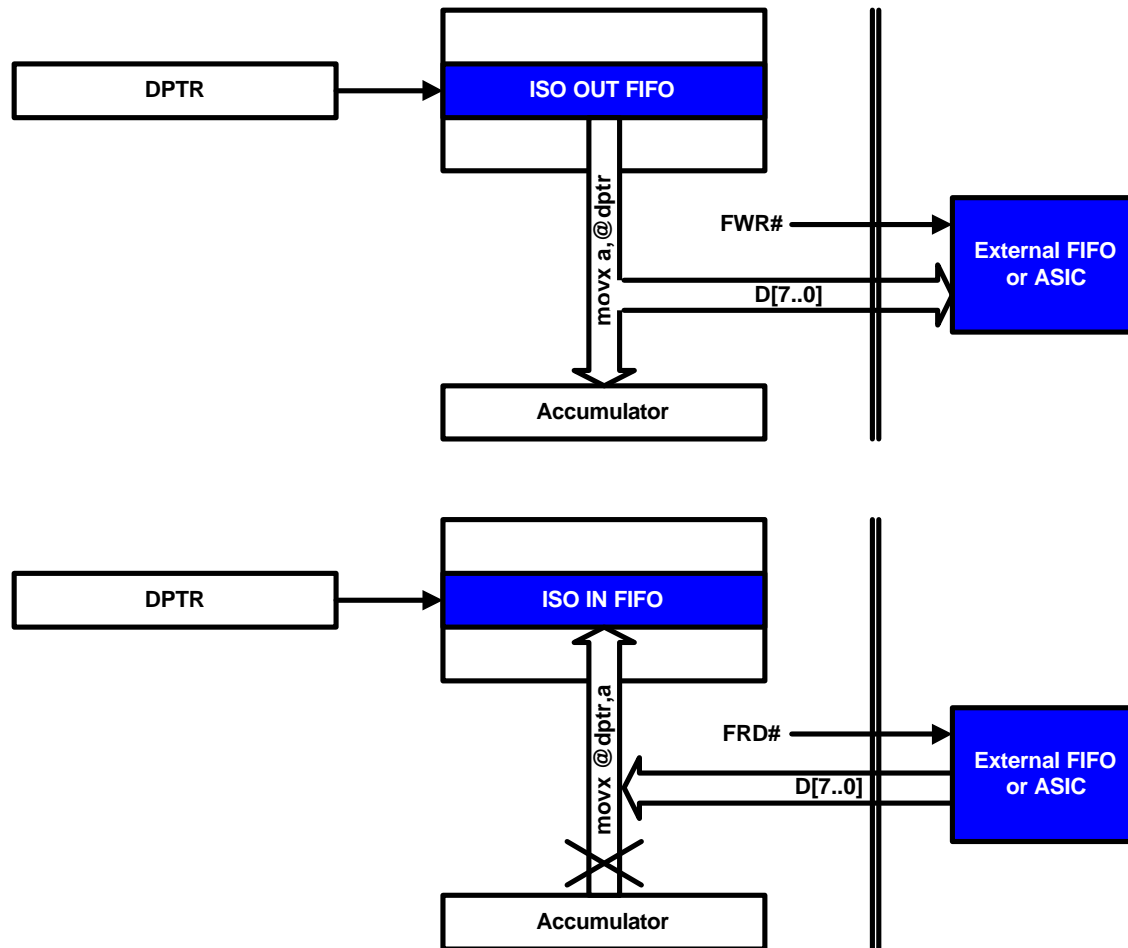


# Watch Those VID-PID-DIDs





# IO Bandwidth Is Important





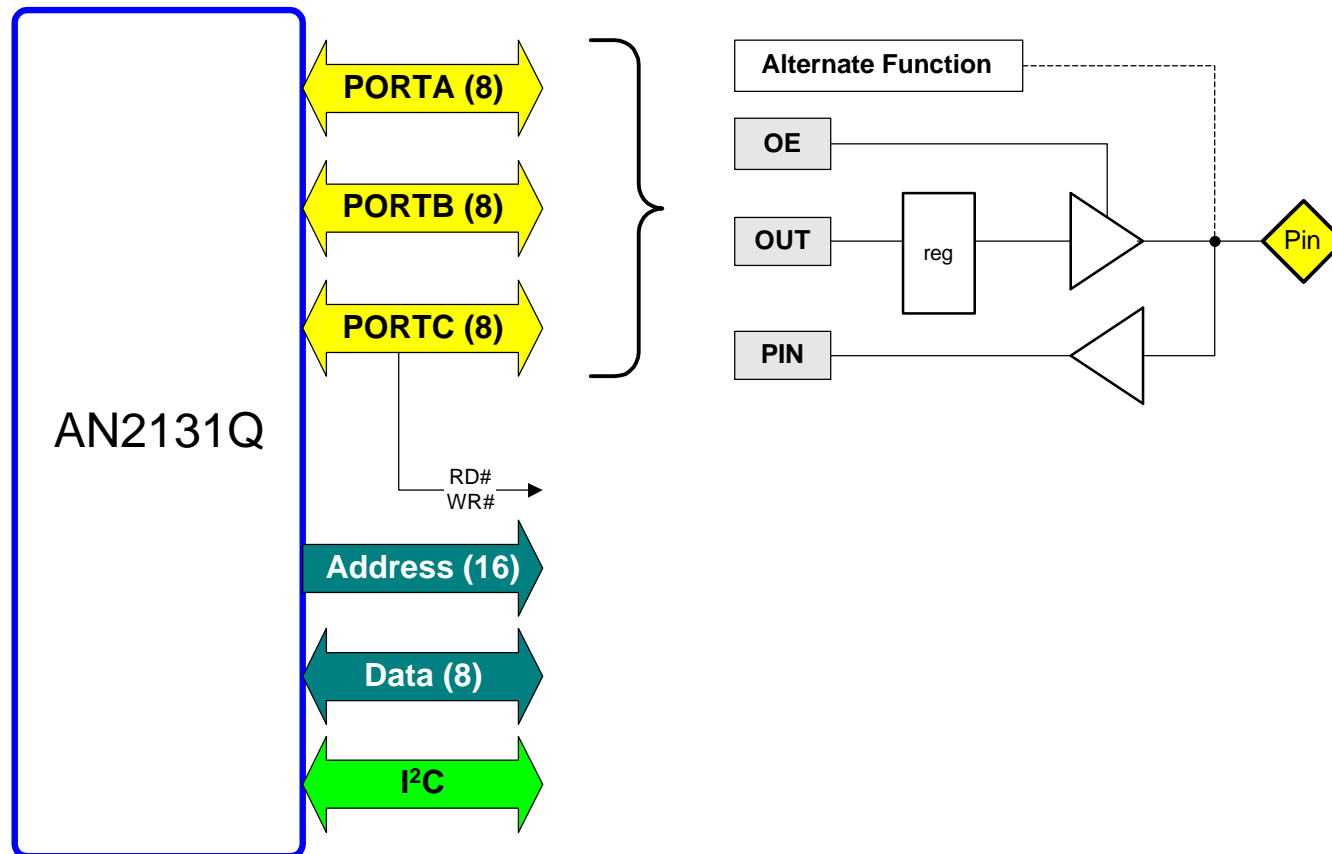
# AN2131 Transfers to External FIFO



2: USB D+ 0: FWR# strobes 1: FRD# strobes 15:8 D[7..0].  
 ISO transfer to endpoint 8 OUT, 1008 bytes of incrementing counter.  
 1008 data bytes transferred to external FIFO using 1008 FWR# strobes,  
 then transferred into EP8IN buffer using 1008 FRD# strobes. 2016 bytes are  
 transferred out of/into AN2131Q in about 700ns or 70% of the frame time.



# Expanding the AN2131Q







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