CMUcam4

Electrical Characteristics

For the SparkFun CMUcam4 v10

Electrical Characteristics

Table 1: Current and Power Dissipation – Data in all columns taken at room temperature (25 °C) with 5 V input

Parameter	Min	Typical	Max	Units	Conditions
Camera Board Idle Current	34.5	35.5	36.5	mA	Assuming the power and auxiliary LED are disabled – see Table 2 (below) for more information
Camera Board Idle Power Dissipation	172.5	177.5	182.5	mW	
Camera Board Active Current	44.5	45.5	46.5	mA	
Camera Board Active Power Dissipation	222.5	227.5	232.5	mW	
Camera Board "SL" Current	34.5	35.5	36.5	mA	Assuming the power LED is disabled – see Table 2 (below) for more information
Camera Board "SL" Power Dissipation	172.5	177.5	182.5	mW	
Camera Board "SD" Current	0.7	1.7	2.7	mA	
Camera Board "SD" Power Dissipation	3.5	8.5	13.5	mW	
Camera Module Idle Current	53.5	54.5	55.5	mA	XCLK = 48 MHz, PCLK = 24 MHz
Camera Module Idle Power Dissipation	267.5	272.5	277.5	mW	
Camera Module Active Current	53.5	54.5	55.5	mA	XCLK = 48 MHz, PCLK = 24 MHz
Camera Module Active Power Dissipation	267.5	272.5	277.5	mW	
Camera Module "SL" Current	0.5	1.0	1.5	mA	SCCB-Initiated Standby
Camera Module "SL" Power Dissipation	2.5	5.0	7.5	mW	
Camera Module "SD" Current	0.010	0.015	0.020	mA	PWDN-Initiated Standby
Camera Module "SD" Power Dissipation	0.050	0.075	0.100	mW	
µSD Card Idle Current	0.2	0.5	0.8	mA	While the µSD card is not being accessed
µSD Card Idle Power Dissipation	1.0	2.5	4.0	mW	
µSD Card Active Current	2	5	8	mA	Current and power consumption may spike up to 10X while writing data
µSD Card Active Power Dissipation	10	25	40	mW	
µSD Card "SL" Current	0.2	0.5	0.8	mA	-
µSD Card "SL" Power Dissipation	1.0	2.5	4.0	mW	-
µSD Card "SD" Current	0.2	0.5	0.8	mA	-
µSD Card "SD" Power Dissipation	1.0	2.5	4.0	mW	-
TV Generator Idle Current	13	14	15	mA	See the "M1" (Monitor On) command – tested in a no-load scenario
TV Generator Idle Power Dissipation	65	70	75	mW	
TV Generator Active Current	13	14	15	mA	
TV Generator Active Power Dissipation	65	70	75	mW	
TV Generator "SL" Current	0	0	0	mA	See the "M0" (Monitor Off) command - tested in a no-load scenario
TV Generator "SL" Power Dissipation	0	0	0	mW	
TV Generator "SD" Current	0	0	0	mA	
TV Generator "SD" Power Dissipation	0	0	0	mW	

Parameter Totals	With a µSD Card				Without a µSD Card			
Total Idle Current	101.2	104.5	107.8	mA	101	104	107	mA
Total Idle Power Dissipation	506.0	522.5	539.0	mW	505	520	535	mW
Total Active Current	113	119	125	mA	111	114	117	mA
Total Active Power Dissipation	565	595	625	mW	555	570	585	mW
Total "SL" Current	35.2	37.0	38.8	mA	35.0	36.5	38.0	mA
Total "SL" Power Dissipation	176.0	185.0	194.0	mW	175.0	182.5	190.0	mW
Total "SD" Current	0.910	2.215	3.520	mA	0.710	1.715	2.720	mA
Total "SD" Power Dissipation	4.550	11.075	17.600	mW	3.550	8.575	13.600	mW

Note 1: "SL" (Sleeping Lightly) – Please see the "SL" (Sleep Lightly) command.
Note 2: "SD" (Sleeping Deeply) – Please see the "SD" (Sleep Deeply) command.

Table 2: Current and Power Dissipation – Data in all columns taken at room temperature (25 °C) with 5 V input

Parameter	Min	Typical	Max	Units	Conditions
Power LED Current	2.5	3	3.5	mA	Please see Note 3
Power LED Power Dissipation	12.5	15	17.5	mW	
Auxiliary LED Current	2.5	3	3.5	mA	Please see Note 4
Auxiliary LED Power Dissipation	12.5	15	17.5	mW	

Note 3: If the power LED is not disabled, increase the total current and power consumption for the camera board in Table 1 by the amount in Table 2 for the power LED. The power LED can be disabled by cutting the trace on the camera board located right next to "PWR" label inside of the copper solder jumper. To re-enable the power LED, bridge the copper solder jumper using a ball of solder.

Note 4: If the auxiliary LED is not disabled, increase the total current and power consumption for the camera board in Table 1 by the amount in Table 2 for the auxiliary LED. The auxiliary LED can be disabled by using the "L0" (LED Off) command or by cutting the trace on the camera board located right next to the "AUX" label inside of the copper solder jumper. To re-enable the auxiliary LED, bridge the copper solder jumper using a ball of solder.

Table 3: Electrical Characteristics – Data in all columns taken at room temperature (25 °C) with 5 V input

Parameter	Min	Typical	Max	Units	Notes
Operating Temperature Range	10	25	40	°C	Can be 12 V at or around room temperature – 25 °C
Supply Voltage Range	4	5	9	V	
Pan and Tilt Pin Maximum Short-circuit Current	-	-	7	mA	A 430 Ω resistor is in series with both the pan and tilt pins to prevent shorts
Pan and Tilt Pin Maximum Power Dissipation	-	-	35	mW	
Pan Pin Output High	2.8	2.9	3.0	V	-
Pan Pin Output Low	0.0	0.2	0.4	V	-
Pan Pin Input High	1.8	-	3.3	V	-
Pan Pin Input Low	0.0	-	0.6	V	-
Tilt Pin Output High	2.8	2.9	3.0	V	-
Tilt Pin Output Low	0.0	0.2	0.4	V	-
Tilt Pin Input High	1.8	-	3.3	V	-
Tilt Pin Input Low	0.0	-	0.6	V	-
TX Out Pin Output High	2.8	2.9	3.0	V	3.3 V and 5 V tolerant
TX Out Pin Output Low	0.0	0.2	0.4	V	
RX In and DTR Pin Input High	0.0	3.3	12.0	V	3.3 V and 5 V tolerant
RX In and DTR Pin Input Low	-0.2	0.0	0.2	V	

Component Characteristics

Table 4: Component Characteristics – Data in all columns taken at room temperature (25 °C) with 5 V input

Parameter	Min	Typical	Max	Units	Notes
P8X32A Processor Frequency	-	96	-	MHz	20 KHz while "SD" (Sleeping Deeply)
P8X32A Processor Instructions per Second	-	192	-	MIPS	Split among 8 cores (24 MIPS per core)
P8X32A Processor RAM	-	32	-	KB	-
P8X32A Processor ROM	-	32	-	KB	64 KB EEPROM
OV9665 Camera Horizontal Resolution	-	640	-	pixels	Down-sampled by 4X to 160 pixels
OV9665 Camera Vertical Resolution	-	480	-	pixels	Down-sampled by 4X to 120 pixels
OV9665 Color Depth	-	16	-	bits	5-bits (R/V) : 6-bits (G/Y) : 5-bits (B/U)
OV9665 Frame Rate	-	30	-	FPS	-
Servo Controller Frequency	-	50	-	Hz	-
Servo Controller Resolution	-	1	-	µS	-
Serial Baud Rate	1	19,200	250,000	BPS	See "BM" (Baud Mode) command
Serial Stop Bits	1	1	2^{31}	Bits	See "DM" (Delay Mode) command