























## 4.6 USB Electrical Characteristics

Line	PROPERTY	MIN	TYPICAL	MAX
1	Supply Voltage [VIN]	3.0V	3.3V	3.6V
2	Supply Power Consumption [VIN_33] @ 25°C			300 mW
3	Supply Current @ 25°C VBUS = 3.3 V		80 mA	
4	Shutdown Current		0.2 uA	1 uA
5	USB BUS supply voltage - VDD(IO) ≥ 2.2V - VDD(IO) ≥ 0V	0 0		5.25V 3.60V
6	USB D+ Input voltage - VDD(IO) ≥ 2.2V - VDD(IO) ≥ 0V	0 0		5.25V 3.60V
7	USB D- Input voltage - VDD(IO) ≥ 2.2V - VDD(IO) ≥ 0V	0 0		5.25V 3.60V
8	Pull-down resistance (kΩ)	48	64	80
9	Common-mode input voltage (mV) - High speed mode - Full/low speed mode - Chirp mode	-50 800 -50	200 - -	500 2500 600
10	Differential input mode voltage (mV)	100	400	1100
11	Rise time (10% to 90%) (ns)	4		20
12	Fall time (90% to 10%) (ns)	4		20
13	Output signal crossover voltage (V)	1.3		2.0
14	Source SEO interval of EOP (ns)	160		175
15	Source jitter for differential transition to SEO transition (ns)	-2		5

Table 4: USB Interface Electrical Characteristics

Note: Test condition: CL = 50pF, Rpu = 1.5kΩ on D+ to VDD, 3.0V ≤ VDD ≤ 3.6V, See details for NXP4330 processor datasheet: LPC4350\_30\_20\_10.pdf.

## 4.7 Seek Thermal Supplied Coprocessor Boards

A customer may opt to purchase the Micro Core Interface Kit from Seek with a Micro Core. The interface kit includes a sensor to coprocessor flex and a PCB that already houses the USB Coprocessor circuit. This same coprocessor board and flex are used in the Micro Core USB Starter Kit. The coprocessor board utilizes a 20 pin Hirose board-to-board connector:

- Connector on the USB Coprocessor board:
  - Hirose DF40C-20DP-0.4V(51)
- Mating Connector to be used on customer design:
  - Hirose DF40C-20DS-0.4V(51) (various stack height options available)

NOTE: These connectors are 20 pin connectors, but they physically have 24 pins. The 4 corners pins are used for mechanical retention and are connected to GND.









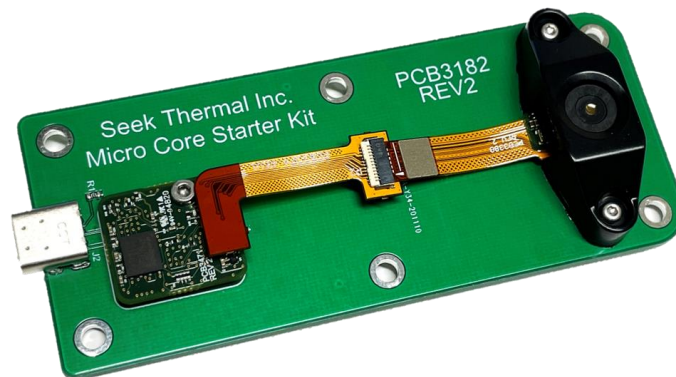




## 8 Appendix: Micro Core Starter Kits

### 8.1 USB Starter Kit

The Micro Core USB starter kit is a great option to get up and running with minimal effort. The USB starter kit allows developers to quickly assess the Micro Core image quality and thermography properties in the Seek Simple Viewer app. Alternatively, with minimal effort, a developer may install and configure the SDK sample application to test and configure image processing settings.



### 8.2 USB Starter Kit Disassembly and Interfacing

The USB Starter Kit may be disassembled, and the Micro Core and coprocessor board integrated further into a development system. See section 4.7 Seek Thermal Supplied Coprocessor Boards for more details.

### 8.3 SPI Starter Kit

The Micro Core SPI starter kit is the SPI Coprocessor circuit implemented on a simple to use development board. The SPI signals, voltage rails and control signals are easily accessible on a pin header. These signals can be jumped over to a host processor board to start developing a SPI based Micro Core system with minimal hardware development. The SPI starter kit requires more effort than the USB starter kit to get to a point where image quality can be assessed as the SPI interface requires custom driver and application code development for the selected host processor. Please refer to the Micro Core SPI documentation for further details.





## 10 Appendix: SPI Coprocessor Circuit BOM

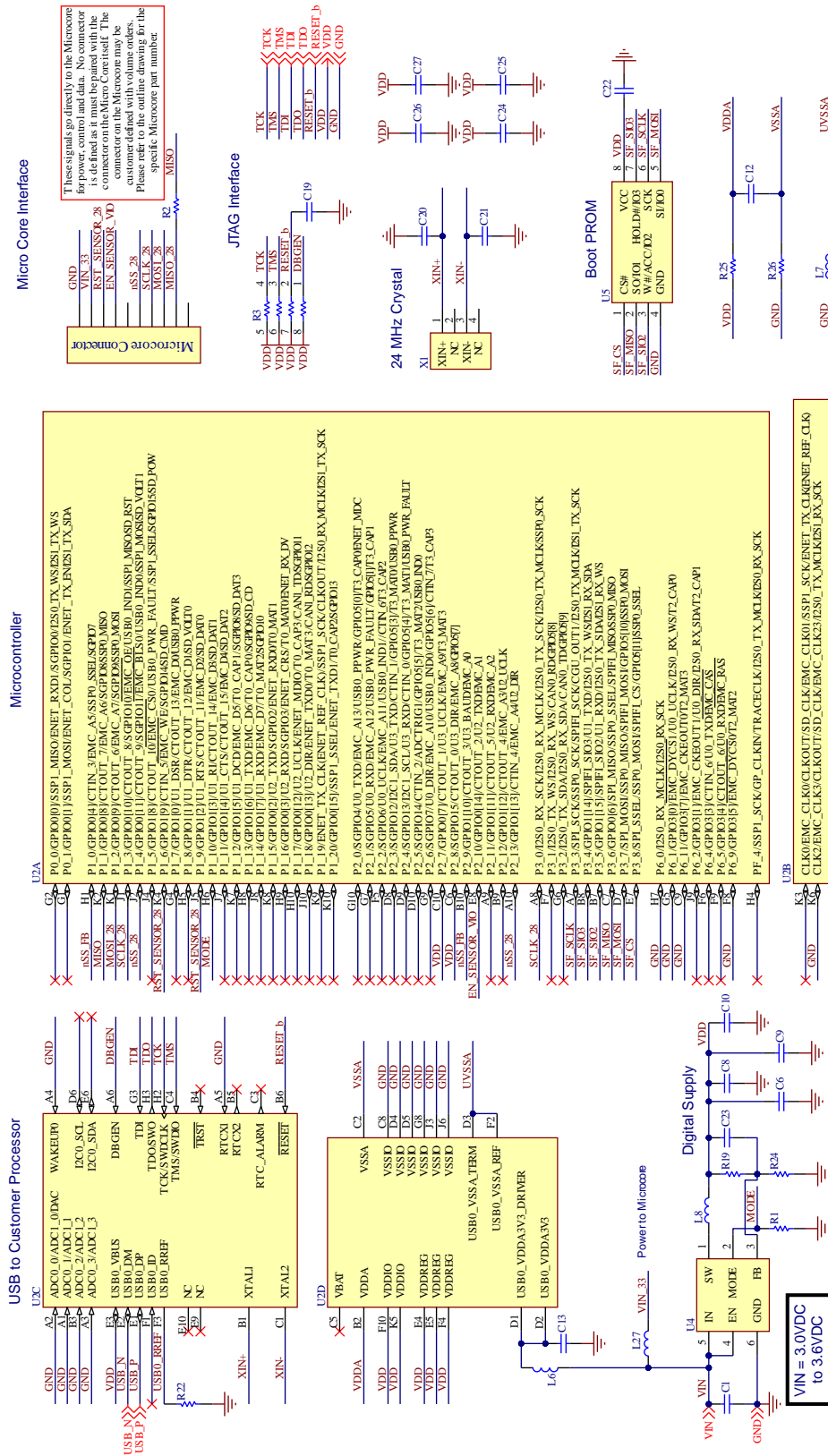
PART NUMBER	MFG	VALUE	DESCRIPTION	REF DES	QTY	NOTES
CAPACITOR	GENERIC	0.1uF	CAP CER 0.1UF X7R	C1, C4, C6, C7, C9, C10, C11	7	
CAPACITOR	GENERIC	1.0uF	CAP CER 1.0UF X7R	C2, C3, C5	3	
AYF531065T	PANASONIC		CONN FPC 10POS 0.50MM R/A	P1	1	
RESISTOR	GENERIC	100k	RES 100 KOHM	R1	1	
RESISTOR	GENERIC	10	RES 10 OHM	R2	1	
RESISTOR	GENERIC	100	RES 100 OHM QUAD	R3	1	1
MAX32660GTG+	MAXIM IC		IC, MCU, CORTEX M4F 96MHZ ME11 TQFN	U1	1	2
74AVC2T45GN	NEXPERIA		IC TRNSLTR BIDIRECTIONAL 8XSON	U2, U3, U4	3	3

<sup>1</sup> A quad pack resistor is shown, this may be substituted with discrete resistors

<sup>2</sup> This part number represents the stock part from Maxim, please speak with Seek to obtain the pre-programmed Maxim part number.

<sup>3</sup> Alternate footprints may be used if available. Alternate manufacturers and part numbers have not been validated by Seek but may be used at customer's risk. Seek recommends against auto-direction sensing level shifters.

# 11 Appendix: USB Coprocessor Circuit Schematic



## 12 Appendix: USB Coprocessor Circuit BOM

This BOM is focused on automotive applications so it contains parts that are AEC-Q rated for automotive use. The parts listed as “Generic” are commonly available in AEC-Q rated versions and are up to the customer to select. Except for U2 and U5, the customer may replace non-generic components with alternates at their own risk.

MFR PN	MFR	DESCRIPTION	REF DES	QTY	NOTES
CAPACITOR	Generic	CAP CER 4.7UF 6.3V 20% X5R	C1,C6	2	
CAPACITOR	Generic	CAP CER 1000PF 25V 5% NPO	C10	1	
CAPACITOR	Generic	CAP CER 18PF 50V 5% NPO	C20,C21	2	
CAPACITOR	Generic	CAP CER 22PF 50V 5% NPO	C23	1	
CAPACITOR	Generic	CAP CER 0.1UF 16V 10% X7R	C8,C12,C13,C19,C22, C24,C25,C26,C27	9	
CAPACITOR	Generic	CAP CER 10000PF 16V 10% X7R	C9	1	
BK0603TS121-TV	Taiyo Yuden	FERRITE BEAD 100 OHM 2A	L1	1	1
MLF1005G2R2JTD25	TDK	IND 2.2UH 30mA 5% SMD	L27	1	1
BK1005HS601-TV	Taiyo Yuden	FERRITE CHIP 600 OHM 300MA	L6,L7	2	1
MLZ2012M2R2HTD25	TDK	IND 2.2UH 600mA 160MOHM 20%	L8	1	1
RESISTOR	Generic	RES 182K OHM 1/16W 1%	R1,R24	2	
RESISTOR	Generic	RES 665K OHM 1/16W 1%	R19	1	
RESISTOR	Generic	RES 100 OHM 1/10W 5%	R2	1	
RESISTOR	Generic	RES 12K OHM 1/10W 1%	R22	1	
RESISTOR	Generic	RES 10 OHM 1/10W 5%	R25	1	
RESISTOR	Generic	RES 0.0 OHM 1/16W JUMP	R26	1	
EXB-28V103JX	Panasonic	RES ARRAY 10K OHM 4 RES	R3	1	1, 4
LPC4330FET100,551	NXP	IC MCU 32BIT ROMLESS 100TFBGA	U2	1	2
TPS62260TDRVRQ1	TI	IC REG BUCK SYNC ADJ 0.6A 6SON	U4	1	1, 3
MX25L3233FZBR-08Q	Macronix	IC FLASH 32MBIT 104MHZ 8WSON	U5	1	1, 3
XRCGB24M000F3A00R0	Murata	CRYSTAL HYBRID 24MHZ 6PF SMD	X1	1	1, 3

1 Components are AEC-Q rated for automotive applications.

2 U2 is not AEC-Q100 qualified and there is not suitable alternate part. It is the customer's responsibility to qualify this part for use in automotive applications.

3 Alternate footprints may be used if available.

4 A quad pack resistor is shown, this may be substituted with discrete resistors