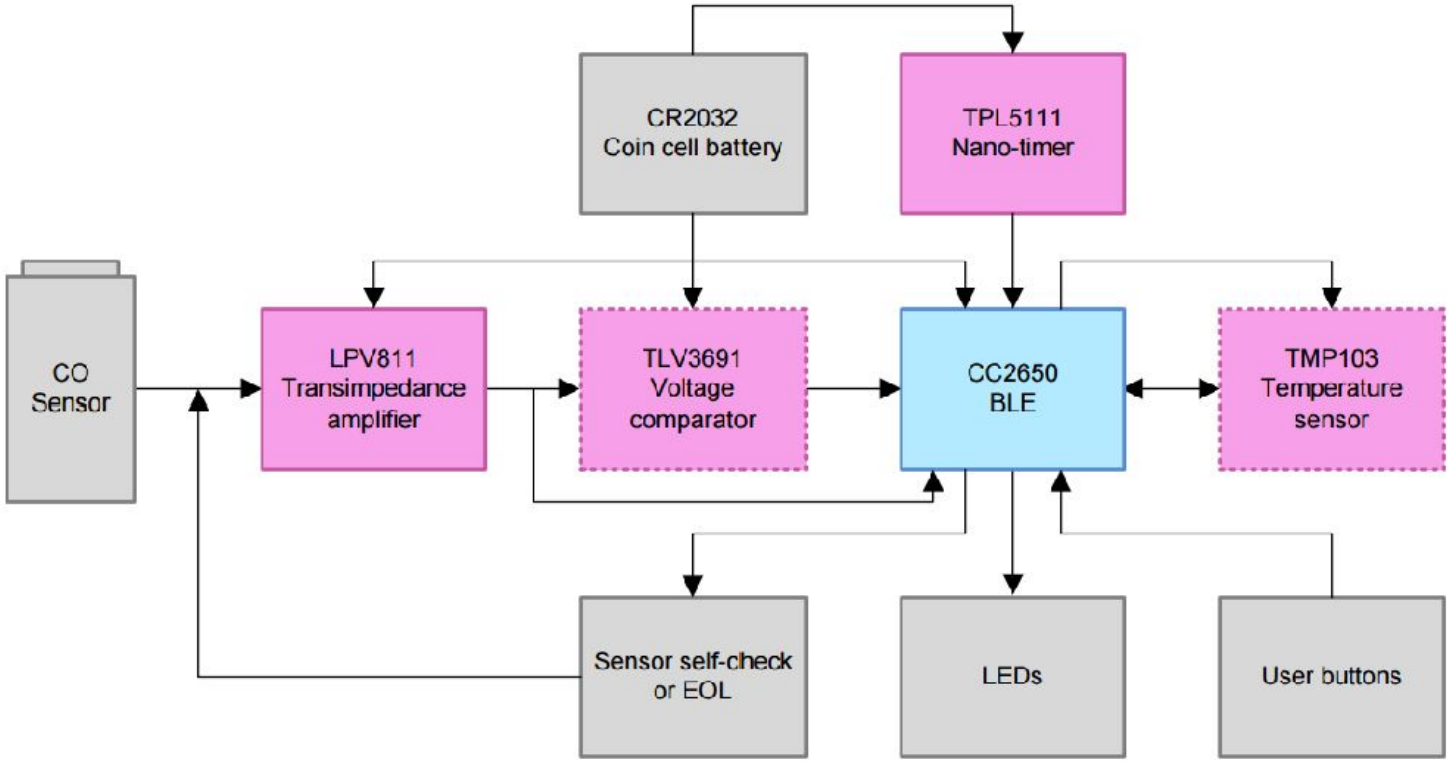
Revision History				
Rev	ECN #	Approved Date	Approved by	Notes
E1	N/A	28 April 2016	Gustavo Martinez	Initial Release
E2	N/A	17 June 2016	Gustavo Martinez	Changed timer interval (R17 & R18) to 5 mins.
				Moved WE net to include J1 for both sensors.
				Other cosmetic (non-functional) changes.



Orderable: EVM_orderable	Designed for:Public Release	Mod. Date: 10/21/2016
TID #: TIDA-00756	Project Title:Low Power CO Gas Sensor w/ BLE Connectivity	
Number: TIDA-00756 Rev: E2	Sheet Title:Cover Sheet	
SVN Rev: Version control disabled	Assembly Variant:[No Variations]	Sheet:1 of 4
Drawn By:	File: TIDA-00756_CoverSheet.SchDoc	Size: B
Engineer: Gustavo Martinez	Contact: http://www.ti.com/support	

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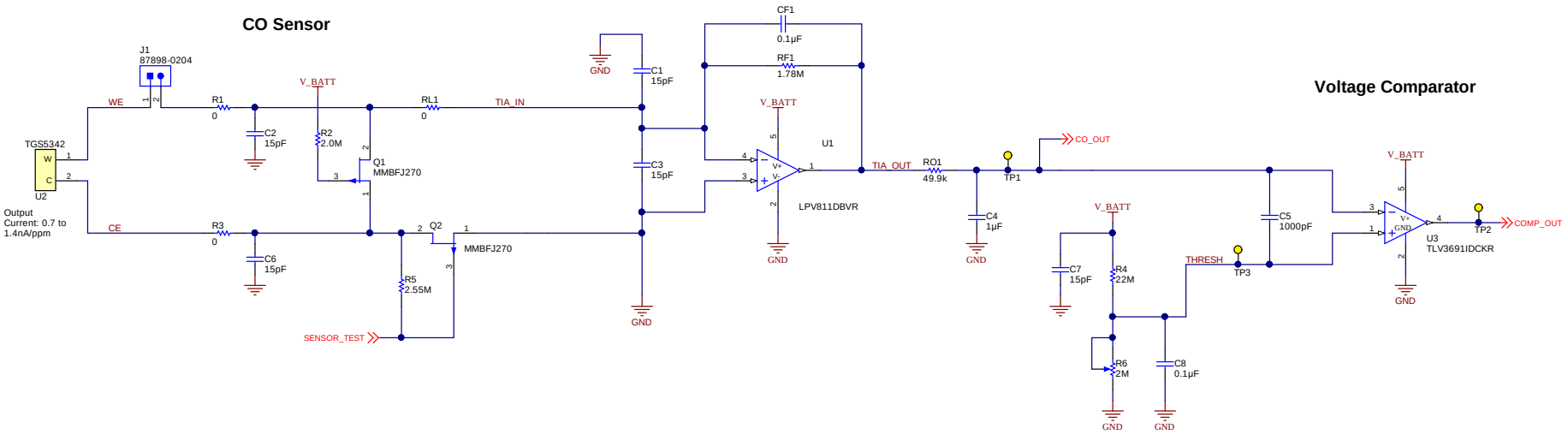
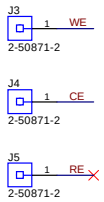
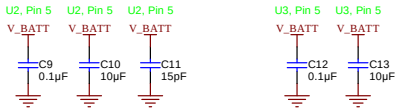
Transimpedance Amplifier



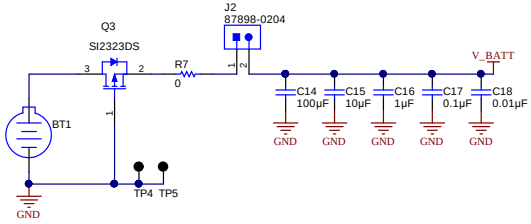
CO Sensor (Alternate Footprint)



Op-Amp Bypass Capacitors

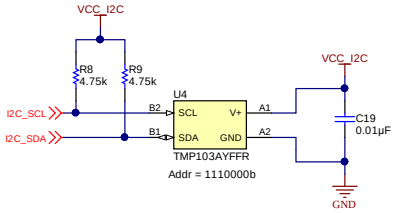


Battery Connector & Reservoir Capacitors

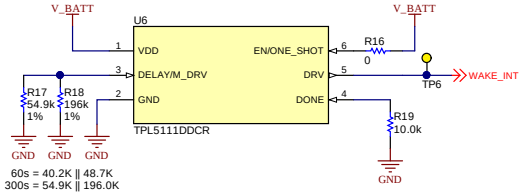


Orderable: EVM_orderable	Designed for:Public Release	Mod. Date: 10/20/2016
TID #: TIDA-00756	Project Title:Low Power CO Gas Sensor w/ BLE Connectivity	
Number: TIDA-00756 Rev: E2	Sheet Title:CO Gas Sensor	
SVN Rev: Version control disabled	Assembly Variant:[No Variations]	Sheet:2 of 4
Drawn By:	File: TIDA-00756_CO_Sensor.SchDoc	Size: B
Engineer: Gustavo Martinez	Contact: http://www.ti.com/support	

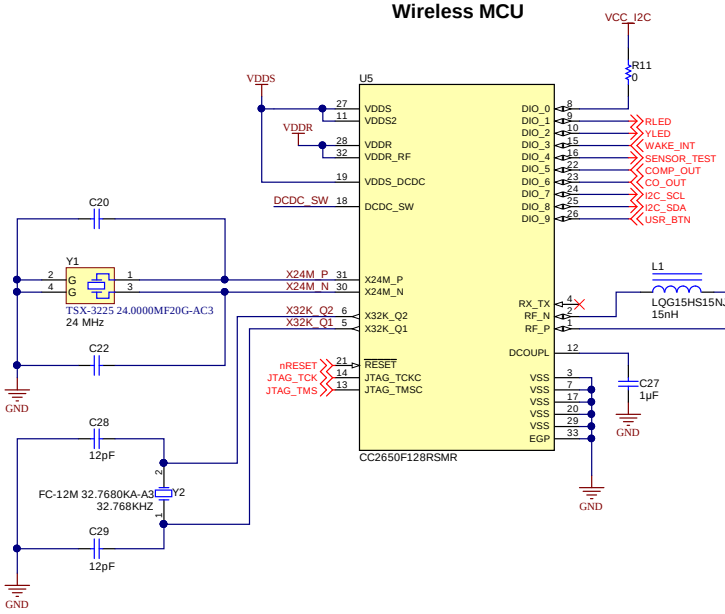
Temperature Sensor



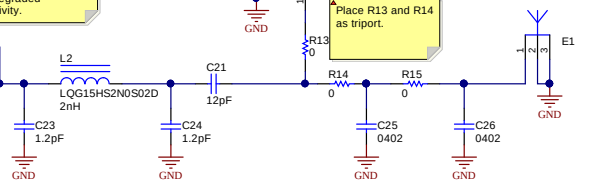
Nano Timer



Wireless MCU



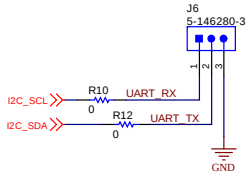
RF_N is used for RX biasing. L1 may be removed at the cost of 1dB degraded sensitivity.



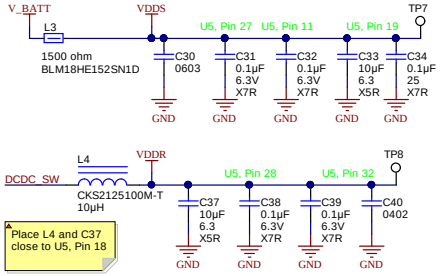
Place R13 and R14 as triport.

Inverted F antenna matched directly to 50Ohm, no external matching components required.

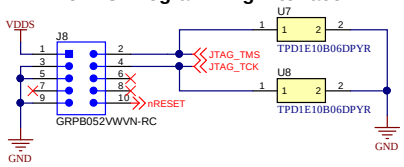
UART Communication



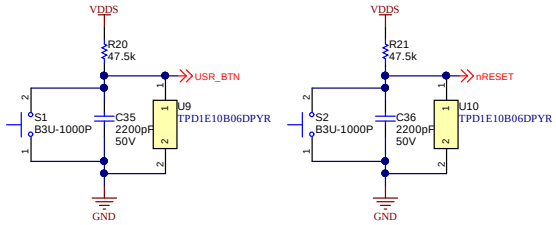
Wireless MCU Bypass Capacitors & DC-DC Passives



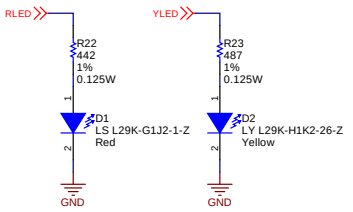
JTAG Programming Interface



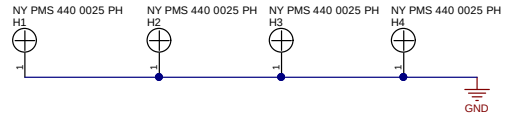
Test and Reset Buttons

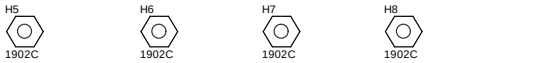


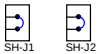
User LEDs

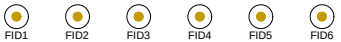


Orderable: EVM_orderable	Designed for:Public Release	Mod. Date: 10/20/2016
TID #: TIDA-00756	Project Title:Low Power CO Gas Sensor w/ BLE Connectivity	
Number: TIDA-00756 Rev: E2	Sheet Title:Wireless MCU	
SVN Rev: Version control disabled	Assembly Variant:[No Variations]	Sheet:3 of 4
Drawn By:	File: TIDA-00756_MCU.SchDoc	Size: B
Engineer: Gustavo Martinez	Contact: http://www.ti.com/support	http://www.ti.com









PCB Number: TIDA-00756
PCB Rev: E2

PCB LOGO
Texas Instruments

PCB LOGO
Pb-Free Symbol

PCB LOGO
FCC disclaimer

ZZ2
Assembly Note
These assemblies are ESD sensitive, ESD precautions shall be observed.

ZZ3
Assembly Note
These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.

ZZ4
Assembly Note
These assemblies must comply with workmanship standards IPC-A-610 Class 2, unless otherwise specified.

Orderable: EVM_orderable	Designed for:Public Release	Mod. Date: 10/20/2016
TID #: TIDA-00756	Project Title:Low Power CO Gas Sensor w/ BLE Connectivity	
Number: TIDA-00756 Rev: E2	Sheet Title:Hardware	
SVN Rev: Version control disabled	Assembly Variant:[No Variations]	Sheet:4 of 4
Drawn By:	File: TIDA-00756_Hardware.SchDoc	Size: B
Engineer: Gustavo Martinez	Contact: http://www.ti.com/support	

Texas Instruments
http://www.ti.com

Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	0.40mil	3.5	
3	Top Layer	Copper	1.42mil		
4	Dielectric1	370HR	14.00mil	4.2	
5	Signal Layer 1	Copper	1.42mil		
6	Dielectric 2	370HR	10.00mil	4.2	
7	Signal Layer 2	Copper	1.42mil		
8	Dielectric 3	370HR	14.00mil	4.2	
9	Bottom Layer	Copper	1.42mil		
10	Bottom Solder	Solder Resist	0.40mil	3.5	
11	Bottom Overlay				

Impedance Control:

- Top layer contains 50 ohm impedance (+/- 10%) single ended using 24 mil lines (from E1 to U5)

DESIGN INFORMATION	
MIN. TRACK WIDTH:	6 MIL
MIN. CLEARANCE:	6 MIL
MIN. VIA PAD SIZE:	20 MIL

MINIMUM ANNULAR RING 0.05mm (2MIL) EXTERNAL
PER IPC-D-275 CLASS 2 LEVEL C
REGISTRATION TOLERANCES: METAL +/- 5 MIL, HOLES +/- 3 MIL
HOLE SIZE TOLERANCE (UNLESS OTHERWISE SPECIFIED): +/- 3 MIL

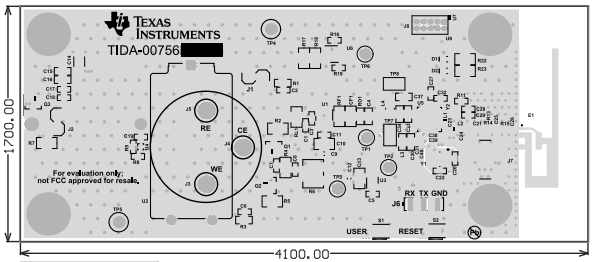
MATERIAL:
[ ] FR-408 [X] FR-4 High Tg [ ] OTHER _____
THICKNESS: [ ] 62 MIL (1.6mm) +/-10% [X] OTHER 44 MIL +/-10%
TOLERANCE: [X] ANSI IPC-6012 TYPE 3 CLASS 2
[ ] OTHER +/- _____
BOW & TWIST: [X] ANSI IPC-6012 TYPE 3 CLASS 2
[ ] OTHER +/- _____

DRILLING:
REFERENCE: [X] AS SHOWN [X] NC_DRILL FILES
PTH COPPER THICKNESS: [X] 20-30 um [ ] OTHER _____

BOARD FINISH:
SILKSCREEN: [X] TOP [X] BOTTOM
SILKSCREEN COLOR: [X] WHITE [ ] OTHER _____
SOLDER RESIST COLOR: [X] GREEN [ ] OTHER _____
[X] MATTE [ ] SEMI-GLOSS
SURFACE FINISH: [X] IMMERSION GOLD (ENIG) [ ] ENEPIG
[ ] IMM. TIN/SILVER OR EQUIV [ ] OTHER _____
ARRAY/PANEL: [ ] CUT AND TRIM PER M1 BOARD OUTLINE
[ ] N.C. ROUTE [X] V. SCORE
CERTIFICATION: MATERIALS AND WORKMANSHIP FOR ALL PCBS TO MEET OR EXCEED THE REQUIREMENTS OF:
[X] ANSI IPC-A-600F CLASS -> [ ] 1 [X] 2 [ ] 3
[X] RoHS [ ] OTHER PER ORDER
ALL BOARDS MUST MEET OR EXCEED UL94-V0 REQUIREMENTS.
PCB MUST BEAR THE UL94V-0 UL REGISTERED MATERIAL ID NUMBER

ADDITIONAL REQUIREMENTS:
MICROSECTION: [ ] YES
BARE BOARD ELEC. TEST: [ ] NONE [X] REQUIRED [ ] PER ORDER

Z22 ■ These assemblies are ESD sensitive, ESD precautions shall be observed.
Z23 ■ These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.
Z24 ■ These assemblies must comply with workmanship standards IPC-A-610 Class 2, unless otherwise specified.



COMPONENTS MARKED 'DNP' SHOULD NOT BE POPULATED
ASSEMBLY VARIANT: [No Variations]

TEXAS INSTRUMENTS

PROJECT TITLE: Low Power CO Gas Sensor w/ BLE Connectivity
DESIGNED FOR: Public Release
FILE NAME: TIDA-00756.PcbDoc

ENGINEER: Gustavo Martinez	LAYOUT BY: Krypton Solutions/RS
SCALE: 0.72	ALTIUM DESIGNER VERSION: 16.0.9.368

Comment	Description	Designator	Footprint	LibRef	Quantity
Printed Circuit Board	Printed Circuit Board	PCB1		PCB	1
BS-7	Battery Holder, CR2032, Retainer clip, TH	BT1	BAT_BS-7	BS-7	1
CC0402JRNPO9BN150	CAP, CERM, 15 pF, 50 V, +/- 5%, C0G/NP0, 0402	C1, C2, C3, C6, C7, C11	0402	CC0402JRNPO9BN150	6
C160BX5R1E105K080AC	CAP, CERM, 1 µF, 25 V, +/- 10%, X5R, 0603	C4	0603	C160BX5R1E105K080AC	1
C0402C102J3RACTU	CAP, CERM, 1000 pF, 25 V, +/- 5%, X7R, 0402	C5	0402	C0402C102J3RACTU	1
C1005X7R1H104K	CAP, CERM, 0.1 µF, 50 V, +/- 10%, X7R, 0402	C8	0402	C1005X7R1H104K	1
C0603C104K3RACTU	CAP, CERM, 0.1 µF, 10 V, +/- 10%, X7R, 0603	C9, C12	0603L	C0603C104K8RACTU	2
C2012X5R0J106M	CAP, CERM, 10 µF, 6.3 V, +/- 20%, X5R, 0805	C10, C13	0805_HV	C2012X5R0J106M	2
C3216X5R1A107M160AC	CAP, CERM, 100 µF, 10 V, +/- 20%, X5R, 1206_190	C14	1206_190	C3216X5R1A107M160AC	1
C160BX5R0J106M	CAP, CERM, 10 µF, 6.3 V, +/- 20%, X5R, 0603	C15	0603	C160BX5R0J106M	1
C160BX7R1C105K	CAP, CERM, 1 µF, 16 V, +/- 10%, X7R, 0603	C16	0603	C160BX7R1C105K	1
C1005X7R1H104K050BB	CAP, CERM, 0.1 µF, 50 V, +/- 10%, X7R, 0402	C17	0402	C1005X7R1H104K050BB	1
C1005X7R1C103K050BA	CAP, CERM, 0.01 µF, 16 V, +/- 10%, X7R, 0402	C18	0402	C1005X7R1C103K050BA	1
GRM155R71C103KA01D	CAP, CERM, 0.01 µF, 16 V, +/- 10%, X7R, 0402	C19	0402	GRM155R71C103KA01D	1
GRM1555C1E120JA01D	CAP, CERM, 12 pF, 25 V, +/- 5%, C0G/NP0, 0402	C20, C22, C28, C29	0402	GRM1555C1E120JA01D	4
GRM1555C1H120JA01D	CAP, CERM, 12 pF, 50 V, +/- 5%, C0G/NP0, 0402	C21	0402S	GRM1555C1H120JA01D	1
GRM1555C1H1R2BA01D	CAP, CERM, 1.2 pF, 50 V, +/- 0.3%, C0G/NP0, 0402	C23, C24	0402S	GRM1555C1H1R2BA01D	2
Used in BOM report	CAP, CERM, xxxF, xxV, [TempCo], xx%, [PackageReference]	C25, C26, C40	0402S	Capacitor	3
GRM155R61A105KE15D	CAP, CERM, 1 µF, 10 V, +/- 10%, X5R, 0402	C27	0402	GRM155R61A105KE15D	1
Used in BOM report	CAP, CERM, xxxF, xxV, [TempCo], xx%, [PackageReference]	C30	0603	Capacitor	1
GRM155R70J104KA01D	CAP, CERM, 0.1 µF, 6.3 V, +/- 10%, X7R, 0402	C31, C38, C39	0402S	GRM155R70J104KA01D	3
GRM155R70J104KA01D	CAP, CERM, 0.1 µF, 6.3 V, +/- 10%, X7R, 0402	C32	0402	GRM155R70J104KA01D	1
GRM188R60J106ME47D	CAP, CERM, 10 µF, 6.3 V, +/- 20%, X5R, 0603	C33, C37	0603	GRM188R60J106ME47D	2
GRM188R71E104KA01D	CAP, CERM, 0.1 µF, 25 V, +/- 10%, X7R, 0603	C34	0603	GRM188R71E104KA01D	1
C1005X7R1H222K	CAP, CERM, 2200 pF, 50 V, +/- 10%, X7R, 0402	C35, C36	0402	C1005X7R1H222K	2
08053C104KAT2A	CAP, CERM, 0.1 µF, 25 V, +/- 10%, X7R, 0805	CF1	0805_HV	08053C104KAT2A	1
LS L29K-G1J2-1-Z	LED, Red, SMD	D1	LS L29K_Red	LS L29K-G1J2-1-Z	1
LYL29K-H1K2-26-Z	LED, Yellow, SMD	D2	LYL29K_Yellow	LYL29K-H1K2-26-Z	1
ANTENNA_DN007A	2.4GHz PCB Antenna. There is nothing to buy or mount.	E1	ANTENNA_DN007A	ANTENNA_DN007A	1
Fiducial	Fiducial mark. There is nothing to buy or mount.	FID1, FID2, FID3, FID4, FID5, FID6	Fiducial10-20	Fiducial	6
NYPMS 440 0025 PH	Machine Screw, Round, #4-40 x 1/4, Nylon, Phillips panhead	H1, H2, H3, H4	NYPMS 440 0025 PH	NYPMS 440 0025 PH	4
1902C	Standoff, Hex, 0.5"L #4-40 Nylon	H5, H6, H7, H8	Keystone_1902C	1902C	4
87898-0204	Header, 2.54 mm, 2x1, Gold, R/A, SMT	J1, J2	Molex_87898-0204	87898-0204	2
2-50871-2	CONN SOCKET RCPT .056-.065 30AU Gold, TH	J3, J4, J5	TE_2-50871-2	2-50871-2	3
S-146280-3	Header, 2.54mm, 3x1, Gold, TH	J6	TE_S-146280-3	S-146280-3	1
CONSMA001-SMD-G	Jack, SMA, PCB, Gold, SMT	J7	Linx_CONSMA001-SMD-G	CONSMA001-SMD-G	1
GRPB052VWVN-RC	Header, 50mil, 5x2, Gold, TH	J8	CONN_GRPB052VWVN-RC	GRPB052VWVN-RC	1
LQG15HS15NJ02D	Inductor, Multilayer, Air Core, 15 nH, 0.3 A, 0.32 ohm, SMD	L1	IND_LQG15H	LQG15HS15NJ02D	1
LQG15HS2N0S02D	Inductor, Multilayer, Air Core, 2 nH, 0.3 A, 0.1 ohm, SMD	L2	IND_LQG15H	LQG15HS2N0S02D	1
BLM18HE152SN1D	Ferrite Bead, 1500 ohm @ 100 MHz, 0.5 A, 0603	L3	0603	BLM18HE152SN1D	1
CKS212S100M-T	Inductor, Multilayer, Ferrite, 10uH, 0.11A, 0.52 ohm, SMD	L4	0805_145	CKS212S100M-T	1
MMBFJ270	JFET, P-CH, -30 V, -0.015 A, SOT-23	Q1, Q2	SOT-23	MMBFJ270	2
SI2323DS	MOSFET, P-CH, -20 V, -3.7 A, SOT-23	Q3	SOT-23	SI2323DS	1
CRCW0603000Z0EA	RES, 0, 5%, 0.1 W, 0603	R1, R3	0603	CRCW0603000Z0EA	2
CRCW08052M00JNEA	RES, 2.0 M, 5%, 0.125 W, 0805	R2	0805_HV	CRCW08052M00JNEA	1
ERJ-6GEYK226V	RES, 22 M, 10%, 0.125 W, 0805	R4	0805_HV	ERJ-6GEYK226V	1
CRCW08052M55FKEA	RES, 2.55 M, 1%, 0.125 W, 0805	R5	0805_HV	CRCW08052M55FKEA	1
3224W-1-205E	TRIMMER 2M OHM 0.25W SMD	R6	TRIM_3224W	3224W-1-205E	1
CRCW0805000Z0EA	RES, 0, 5%, 0.125 W, 0805	R7, R10, R12, RL1	0805_HV	CRCW0805000Z0EA	4
CRCW04024K75FKED	RES, 4.75 k, 1%, 0.063 W, 0402	R8, R9	0402	CRCW04024K75FKED	2
CRCW0402000Z0ED	RES, 0, 5%, 0.063 W, 0402	R11, R16	0402	CRCW0402000Z0ED	2
CRCW0402000Z0ED	RES, 0, 5%, 0.063 W, 0402	R13, R14, R15	0402S	CRCW0402000Z0ED	3
ERJ-6ENF5492V	RES, 54.9 k, 1%, 0.125 W, 0805	R17	0805_HV	ERJ-6ENF5492V	1
ERJ-6ENF1963V	RES, 196 k, 1%, 0.125 W, 0805	R18	0805_HV	ERJ-6ENF1963V	1
CRCW040210K0FKED	RES, 10.0 k, 1%, 0.063 W, 0402	R19	0402	CRCW040210K0FKED	1
CRCW040247K5FKED	RES, 47.5 k, 1%, 0.063 W, 0402	R20, R21	0402	CRCW040247K5FKED	2
CRCW08054428FKEA	RES, 442, 1%, 0.125 W, 0805	R22	0805_HV	CRCW08054428FKEA	1
CRCW08054878FKEA	RES, 487, 1%, 0.125 W, 0805	R23	0805_HV	CRCW08054878FKEA	1
CRCW08051M78FKEA	RES, 1.78 M, 1%, 0.125 W, 0805	RF1	0805_HV	CRCW08051M78FKEA	1
CRCW0603349K9FKEA	RES, 49.9 k, 1%, 0.1 W, 0603	RO1	0803	CRCW0603349K9FKEA	1
B3U-1000P	SWITCH TACTILE SPST-NO 0.05A 12V	S1, S2	SW_B3U-1000P	B3U-1000P	2
969102-0000-DA	Shunt, 100mil, Gold plated, Black	SH-J1, SH-J2	SNT-100-BK-G	969102-0000-DA	2
5004	Test Point, Miniature, Yellow, TH	TP1, TP2, TP3, TP6	Keystone5004	5004	4
5011	Test Point, Multipurpose, Black, TH	TP4, TP5	Keystone5011	5011	2
5015	Test Point, Miniature, SMT	TP7, TP8	Testpoint_Keystone_Miniature	5015	2
LPV811DBVR	Precision 425 nA Nanopower Operational Amplifier, DBV0005A (SOT-5)	U1	DBV0005A_N	LPV811DBVR	1
TGS5342	Carbon Monoxide Detector, TH	U2	FIGARO_TGS5342	TGS5342	1
TLV3691IDCKR	0.9-V to 6.5-V, Nanopower Comparator, DCK0005A	U3	DCK0005A_N	TLV3691IDCKR	1
TMP103AYFFR	Low-Power, Digital Temperature Sensor with Two-Wire Interface in WCSP, YFF0004AAAA	U4	YFF0004AAAA	TMP103AYFFR	1
CC2650F128RSMR	Ultra low-power ARM Cortex M3 2.4 GHz Radio MCU, RSM0032B	U5	RSM0032B	CC2650F128RSMR	1
TPL5111DDCR	Nano-power System Timer for Power Gating, DDC0006A	U6	DDC0006A_N	TPL5111DDCR	1
TPD1E10B06DPR	ESD in 0402 Package with 10 pF Capacitance and 6 V Breakdown, 1 Channel, -40 to +125 degC, 2-pin X2SON (DPY), Green (RoHS & no Sb/Br)	U7, U8, U9, U10	DPY0002A	TPD1E10B06DPR	4
TSX-3225 24.0000MF20G-AC3	Crystal, 24 MHz, 9 pF, SMD	Y1	EPSON_TSX-3225	TSX-3225 24.0000MF20G-AC3	1
FC-12M 32.768DKA-A3	Crystal, 32.768kHz, 12.5	Y2	Epson_FC-12M	FC-12M 32.768DKA-A3	1