

| BILL OF MATERIALS (BOM) FOR HEAVY QUARK DETECTOR DATA ACQUISITION SYSTEM 126Y-267912 |     |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                         |                          |          |                            |                       |                          |
|--------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------|----------|----------------------------|-----------------------|--------------------------|
| ITEM                                                                                 | QTY | REF DES                                                                                                                                                                                                                                                                                                                                                                                                        | DESCRIPTION                                             | VENDOR                   | VALUE    | FOOTPRINT                  | PART NO               | NOTES                    |
| 1                                                                                    | 6   | C1,C6,C11,C70,C154,C173                                                                                                                                                                                                                                                                                                                                                                                        | CAPACITOR,10V,CHIP 10%                                  | KEMET                    | 1uF      | 0805                       | C2012X5R1A105K        |                          |
| 2                                                                                    | 5   | C2,C12,C67,C155,C172                                                                                                                                                                                                                                                                                                                                                                                           | CAPACITOR,25V,CHIP                                      | PANASONIC                | 2.2uF    | 0805                       | ECJ-2FF1E225Z         |                          |
| 3                                                                                    | 20  | C3-C4,C10,C13-C17,C21-C22,C32,C42-C44,C147,C151,C168-C171                                                                                                                                                                                                                                                                                                                                                      | CAPACITOR,6.3V,CERAMIC CHIP                             | PANASONIC                | 10uF     | 1206                       | ECJ-3YB0J106K         |                          |
| 4                                                                                    | 18  | C5,C9,C23,C38,C140,C152,C184,C190,C541,C545,C561,C567-C568,C573,C596,C653,C808-C809                                                                                                                                                                                                                                                                                                                            | CERAMIC CAP, 1000pf 10% 25v                             | PANASONIC                | 0.001uF  | 0201                       | ECJ-ZEB1E102K         |                          |
| 5                                                                                    | 49  | C7-C8,C20,C35,C47,C49,C52,C54,C59,C74,C79-C80,C85,C88-C90,C93-C94,C111-C112,C117-C119,C136-C137,C141, C144, C150, C153,C177,C182,C322,C512,C538-C539,C542,C550,C553-C554,C556,C559,C564, C566,C576-C577,C670,C687,C803,C806                                                                                                                                                                                    | CAPACITOR,16V,CHIP                                      | PANASONIC                | 0.1uF    | 0603                       | ECJ-1VB1C104K         |                          |
| 6                                                                                    | 661 | C18-C19,C24-C31,C33-C34,C36-C37,C39-C41,C50-C51,C57-C58,C60-C61,C64-C66,C68-C69,C71-C73,C75-C78,C82-C83,C109-C110,C113-C116,C120-C123,C126-C129,C132-C135,C138-C139,C142-C143,C148-C149,C156-C167,C176,C178-C181,C183,C185-C189,C191-C321,C323-C350,C352-C401,C403-C511,C513-C531,C534-C537,C540,C543-C544,C546,C560,C562-C563,C565,C569-C572,C578-C595,C597-C652,C654-C669,C671-C686,C688-C802,C804-C805,C807 | CAPACITOR,6.3V, CHIP                                    | PANASONIC                | 0.01uF   | 0201_012SQ_023SP           | ECJ-ZEB0J103K         |                          |
| 7                                                                                    | 24  | C45-C46,C55-C56,C62-C63,C107-C108,C130-C131,C145-C146,C351,C402,C532-C533,C547,C549,C552,C555,C557-C558,C574-C575                                                                                                                                                                                                                                                                                              | CAPACITOR,50V,CHIP                                      | PANASONIC                | 150pF    | 0603                       | ECJ-1VC1H151J         |                          |
| 8                                                                                    | 6   | C48,C53,C86-C87,C124-C125                                                                                                                                                                                                                                                                                                                                                                                      | 10uF 25v 10% CERAMIC MULTILAYER CAP                     | TAIYO YUDEN              | 10uF     | 1210                       | TMK325BJ106KN-T       |                          |
| 9                                                                                    | 6   | C81,C84,C91-C92,C548,C551                                                                                                                                                                                                                                                                                                                                                                                      | 10uF 20% 6.3v CAP                                       | PANASONIC                | 10uF     | 0805                       | EJC-2FB0J106M         |                          |
| 10                                                                                   | 12  | C95-C106                                                                                                                                                                                                                                                                                                                                                                                                       | CAP 50V CHIP (10,000pF)                                 | PANASONIC                | 0.01uF   | 0603                       | ECJ-1VB1H103K         | PLACEHOLDER ON THE BOARD |
| 11                                                                                   | 2   | C174-C175                                                                                                                                                                                                                                                                                                                                                                                                      | HIGH TEMP CAP, 3900pf 10% 200v                          | AMC                      | 0.0039uF | C0805                      | 201T15W392KV4         |                          |
| 12                                                                                   | 28  | DS1-DS10,DS13-DS17,DS19,DS24,DS26,DS29,DS32-DS35,DS40-DS44                                                                                                                                                                                                                                                                                                                                                     | LED GREEN CLEAR 0603 SMD (DIG---160-1183-1-ND)          | LITE-ON                  |          | LED2 SMD 0603_063X.031B ST | LTST-C190GKT          |                          |
| 13                                                                                   | 16  | DS11-DS12,DS18,DS20-DS23,DS25,DS27-DS28,DS30-DS31,DS36-DS39                                                                                                                                                                                                                                                                                                                                                    | LED RED CLEAR 0603 SMD                                  | LITE-ON                  |          | LED2 SMD 0603_063X.031B ST | DIGIKEY_160-1181-1-ND |                          |
| 14                                                                                   | 4   | J1,J26,J33,J35                                                                                                                                                                                                                                                                                                                                                                                                 | .100" PITCH, DUAL ROW RA HEADER                         | MOLEX                    |          | 901303224                  | 90130-3224            |                          |
| 15                                                                                   | 4   | J2,J24,J32,J34                                                                                                                                                                                                                                                                                                                                                                                                 | 2MM 24 PIN, 2 ROW RECEPTACLE                            | HRS                      |          | CON DF11_24DS_2DSA         | DF11-24DS-2V20        |                          |
| 16                                                                                   | 1   | J3                                                                                                                                                                                                                                                                                                                                                                                                             | RIGHT ANGLE HEADER, SCREW MOUNT, 24 PIN                 | TYCO ELECTRONICS         |          | CONN HEADER 24P RA         | 2-1586043-4           |                          |
| 17                                                                                   | 1   | J4                                                                                                                                                                                                                                                                                                                                                                                                             | CONNECTOR,JTAG10,RIGHT ANGLE                            | SAMTEC                   |          | J10HLR                     | CA-10HLR-IC-SPT       |                          |
| 18                                                                                   | 5   | J5,J9-J10,J29-J30                                                                                                                                                                                                                                                                                                                                                                                              | MICRO MATE HEADER, TFML SERIES                          | SAMTEC                   |          | TFML-110                   | TFML-110-02-S-D       |                          |
| 19                                                                                   | 5   | J6-J8,J27-J28                                                                                                                                                                                                                                                                                                                                                                                                  | .100 x .100" Low Profile SMT Straight Header            | 3M                       |          | CONN_JTAG_10               | N2510-6VOC-RB-WD      |                          |
| 20                                                                                   | 12  | J11-J22                                                                                                                                                                                                                                                                                                                                                                                                        | LOW PROFILE PLUG                                        | VEND                     |          | CON_P50LE SERIES           | P50LE-050P1-SML-TGF   |                          |
| 21                                                                                   | 1   | J23                                                                                                                                                                                                                                                                                                                                                                                                            | 2MM PITCH, DUAL ROW RA HEADER                           | MOLEX                    |          | CONN HEADER 4P RA          | 87833-0420            |                          |
| 22                                                                                   | 4   | J25,J31,J36-J37                                                                                                                                                                                                                                                                                                                                                                                                | SMA RA NICKEL PLATED                                    | JOHNSON                  |          | J5RSMA                     | 142-0701-306          |                          |
| 23                                                                                   | 4   | L1-L3,L6                                                                                                                                                                                                                                                                                                                                                                                                       | INDUCTOR, 1.0UH                                         | COILCRAFT                | 1uH      | L1008                      | 1008CS-102XJLB        |                          |
| 24                                                                                   | 2   | L4-L5                                                                                                                                                                                                                                                                                                                                                                                                          | 6.8nH 800ma 10% INDUCTOR                                | EPCOS INC.               | 0.0068uH | 0805                       | B82498F3689K          |                          |
| 25                                                                                   | 44  | PTC1-PTC6,PTC17-PTC54                                                                                                                                                                                                                                                                                                                                                                                          | PTC/POLYSWITCH 1.1adc@6vdc                              | RAYCHEM                  |          | MICROSMD_F                 | MICROSMD110F          |                          |
| 26                                                                                   | 6   | PTC7-PTC9,PTC11,PTC14,PTC16                                                                                                                                                                                                                                                                                                                                                                                    | PTC/POLYSWITCH 6adc@30vdc                               | RAYCHEM                  |          | RUE_F_300-900              | RUEF600               |                          |
| 27                                                                                   | 4   | PTC10,PTC12-PTC13,PTC15                                                                                                                                                                                                                                                                                                                                                                                        | PTC/POLYSWITCH 2.5adc@30vdc                             | RAYCHEM                  |          | RUE_F_90-250               | RUEF250               |                          |
| 28                                                                                   | 2   | P1-P2                                                                                                                                                                                                                                                                                                                                                                                                          | 2MM 20 PIN, 2 ROW RECEPTACLE                            | HRS                      |          | CON_DF11-20DS_2DSA         | DF11-20DS-2DSA        |                          |
| 29                                                                                   | 4   | RN1-RN4                                                                                                                                                                                                                                                                                                                                                                                                        | LVDS and LVPECL FPGA TERMINATION NETWORK                | CTS CORP                 |          | BGA_FG64                   | CTS-RT1722B7          | WILL PROVIDE             |
| 30                                                                                   | 6   | R1,R5,R11,R89,R177,R195                                                                                                                                                                                                                                                                                                                                                                                        | RESISTOR, 1/16 W, 1% CHIP                               | PANASONIC                | 10       | R0402A                     | ERJ-2RKF10R0X         |                          |
| 31                                                                                   | 14  | R2-R3,R6-R9,R18-R19,R42,R172,R196-R199                                                                                                                                                                                                                                                                                                                                                                         | RES 124 OHM 1/20W 1% 0201 SMD                           | VISHAY DALE              | 124      | 0201_012SQ_023SP           | CRCW0201124RFNED      |                          |
| 32                                                                                   | 30  | R4,R10,R12,R20,R38-R40,R43,R45,R49,R55-R60,R73-R74,R79-R80,R148,R152,R156-R157,R162-R163, R166-R167,R194,R200                                                                                                                                                                                                                                                                                                  | RES 44.2 OHM 1/16W 1% 0402 SMD                          | VISHAY DALE              | 44.2     | R0402A                     | CRCW040244R2FNED      |                          |
| 33                                                                                   | 1   | R13                                                                                                                                                                                                                                                                                                                                                                                                            | RES 0.0 OHM 1/20W 5% 0201 SMD                           | VISHAY DALE              | 0        | 0201_012SQ_023SP           | CRCW02010000Z0ED      | PLACEHOLDER ON THE BOARD |
| 34                                                                                   | 25  | R14,R21,R24,R34-R37,R48,R52,R76,R81,R96,R99,R131,R134,R151,R155,R178,R181,R188,R193, R296-R297,R307-R308                                                                                                                                                                                                                                                                                                       | RES 10.0K OHM 1/20W 1% 0201 SMD                         | VISHAY DALE              | 10K      | 0201_012SQ_023SP           | CRCW020110K0FNED      |                          |
| 35                                                                                   | 10  | R15,R30-R31,R159-R160,R202-R204,R335,R338                                                                                                                                                                                                                                                                                                                                                                      | RES 49.9 OHM 1/20W 1% 0201 SMD                          | VISHAY DALE              | 49.9     | 0201_012SQ_023SP           | CRCW020149R9FNED      |                          |
| 36                                                                                   | 206 | R16,R28-R29,R32-R33,R90-R93,R126-R128,R138-R142,R158,R161,R171,R186-R187,R191-R192, R201, R206-R257,R260-R275,R278-R295, R298-R306,R309-R314,R339-R418                                                                                                                                                                                                                                                         | RES 100 OHM 1/20W 1% 0201 SMD                           | VISHAY DALE              | 100      | 0201_012SQ_023SP           | CRCW0201100RFNED      |                          |
| 37                                                                                   | 5   | R17,R64,R86,R105,R121                                                                                                                                                                                                                                                                                                                                                                                          | RES 121 OHM 1/16W 1% 0402 SMD                           | VISHAY DALE              | 121      | R0402A                     | CRCW0402121RFNED      |                          |
| 38                                                                                   | 32  | R22-R23,R25-R26,R46-R47,R50-R51,R77-R78,R82-R83,R94-R95,R97-R98,R132-R133,R135-R136,R149-R150,R153-R154,R179-R180,R182-R185,R189-R190                                                                                                                                                                                                                                                                          | RES 0.0 OHM 1/20W 5% 0201 SMD                           | VISHAY DALE              | 0        | 0201_012SQ_023SP           | CRCW02010000Z0ED      | PLACEHOLDER ON THE BOARD |
| 39                                                                                   | 3   | R27,R44,R174                                                                                                                                                                                                                                                                                                                                                                                                   | RES 294 OHM 1/16W 1% 0402 SMD                           | VISHAY DALE              | 294      | R0402A                     | CRCW0402294RFNED      |                          |
| 40                                                                                   | 2   | R41,R173                                                                                                                                                                                                                                                                                                                                                                                                       | RES 365 OHM 1/20W 1% 0201 SMD                           | VISHAY DALE              | 365      | 0201_012SQ_023SP           | CRCW0201365RFNED      |                          |
| 41                                                                                   | 46  | R53-R54,R61-R62,R65-R66,R68-R69,R84-R85,R87-R88,R122-R123,R129-R130,R144-R147,R164-R165,R168-R169,R258-R259,R276-R277, R315-R320,R322,R324,R326-R327,R329-R334,R336-R337                                                                                                                                                                                                                                       | RESISTOR,1/16W,1%,CHIP                                  | DALE                     | 49.9     | 0603                       | CRCW060349R9FRT1      |                          |
| 42                                                                                   | 12  | R63,R67,R70-R72,R75,R137,R143,R170,R175-R176,R205                                                                                                                                                                                                                                                                                                                                                              | RES 1.00K OHM 1/20W 1% 0201 SMD                         | VISHAY DALE              | 1K       | 0201_012SQ_023SP           | CRCW02011K00FNED      |                          |
| 43                                                                                   | 8   | R100-R102,R106-R108,R323,R328                                                                                                                                                                                                                                                                                                                                                                                  | RESISTOR,1/16W,1%,CHIP                                  | DALE                     | 4.99K    | 0603                       | CRCW06034991FRT1      |                          |
| 44                                                                                   | 2   | R103,R124                                                                                                                                                                                                                                                                                                                                                                                                      | RESISTOR,1/16W,1%,CHIP                                  | DALE                     | 100      | 0603                       | CRCW06031000FRT1      |                          |
| 45                                                                                   | 2   | R104,R125                                                                                                                                                                                                                                                                                                                                                                                                      | RESISTOR,1/16W,1%,CHIP                                  | DALE                     | 1K       | 0603                       | CRCW06031001FRT1      |                          |
| 46                                                                                   | 12  | R109-R120                                                                                                                                                                                                                                                                                                                                                                                                      | RESISTOR,1/16W,1%,CHIP                                  | PANASONIC                | 0        | 0603                       | ERJ-3GEY0R00V         |                          |
| 47                                                                                   | 2   | R321,R325                                                                                                                                                                                                                                                                                                                                                                                                      | RESISTOR,1/10W,1%,CHIP                                  | YAGEO                    | 33       | 0603                       | 9C06031A33R0FKHFT     |                          |
| 48                                                                                   | 36  | TP1-TP36                                                                                                                                                                                                                                                                                                                                                                                                       | PROBE TEST POINT                                        |                          |          |                            | TPPOINT_2P            |                          |
| 49                                                                                   | 6   | U1,U6,U9,U70,U138,U161                                                                                                                                                                                                                                                                                                                                                                                         | 3A Low Dropout Regulator                                | LINEAR TECHNOLOGY        |          | TO_DDPACK_LINEAR_MPACKAGE  | LT1587CM-1.5          |                          |
| 50                                                                                   | 84  | U2,U4-U5,U7,U11-U12,U14,U16,U18-U19,U21,U23-U28,U30-U36,U40,U42,U49-U52,U55,U59,U64-U65,U67,U75-U76,U78-U88,U92-U96,U99, U101-U102,U104-U112,U123,U127,U130,U135-U136,U139-U140,U146,U148-U155,U157-U159                                                                                                                                                                                                       | SURFACE MOUNT TEST POINT ON TAPE AND REEL               | KEYSTONE                 |          | TP5015                     | 5015                  |                          |
| 51                                                                                   | 6   | U3,U8,U10,U20,U156,U160                                                                                                                                                                                                                                                                                                                                                                                        | 4.6A Low Dropout Regulator                              | LINEAR TECHNOLOGY        |          | TO_DDPACK_LINEAR_MPACKAGE  | LT1585CM              |                          |
| 52                                                                                   | 1   | U13                                                                                                                                                                                                                                                                                                                                                                                                            | PROGRAMMABLE LVDS OSCILLATOR                            | CARDINAL COMPONENTS INC. |          | CPPV7                      | CPPV7T-BR-105.00      |                          |
| 53                                                                                   | 9   | U15,U39,U41,U74,U77,U114-U115,U145,U147                                                                                                                                                                                                                                                                                                                                                                        | SINGLE/DUAL LVDS LINE RECEIVERS                         | MAXIM                    |          | SOT23-8L                   | MAX9113EKA            |                          |
| 54                                                                                   | 1   | U17                                                                                                                                                                                                                                                                                                                                                                                                            | 3A Low Dropout Regulator                                | LINEAR TECHNOLOGY        |          | TO_DDPACK_LINEAR_MPACKAGE  | LT1587CM-3.3          |                          |
| 55                                                                                   | 2   | U22,U124                                                                                                                                                                                                                                                                                                                                                                                                       | 4-PORT LVDS REPEATERS                                   | MAXIM                    |          | TSSOP16                    | MAX9169EUE            |                          |
| 56                                                                                   | 17  | U29,U44-U47,U68-U69,U71-U72,U117-U120,U141-U144                                                                                                                                                                                                                                                                                                                                                                | 1.6 TO 2.7 GBPS TRANSCEIVER                             | TEXAS INSTRUMENTS        |          | QFP64_5MMSF_472W THERMAL   | TLK27113JR-RCP        |                          |
| 57                                                                                   | 1   | U37                                                                                                                                                                                                                                                                                                                                                                                                            | 4-PORT LVDS REPEATERS                                   | MAXIM                    |          | TSSOP16                    | MAX9170EUE            |                          |
| 58                                                                                   | 2   | U38,U131                                                                                                                                                                                                                                                                                                                                                                                                       | 4.6A Low Dropout Regulator                              | LINEAR TECHNOLOGY        |          | TO_DDPACK_LINEAR_MPACKAGE  | LT1587CM              |                          |
| 59                                                                                   | 1   | U43                                                                                                                                                                                                                                                                                                                                                                                                            | 800 mA Regulator, 2.5V Output                           | LINEAR TECHNOLOGY        |          | SOT223                     | LT1118CST-2.5         |                          |
| 60                                                                                   | 1   | U48                                                                                                                                                                                                                                                                                                                                                                                                            | ProASIC3 Flash Family FPGA                              | ACTEL                    |          | VQFP100                    | A3P250-VQFP100        |                          |
| 61                                                                                   | 12  | U53,U61,U66,U103,U122,U128,U162-U164,U167-U169                                                                                                                                                                                                                                                                                                                                                                 | QUAD RAIL TO RAIL 150MHz AMP                            | ANALOG DEVICES           |          | SO14NB                     | AD8044AR-14           |                          |
| 62                                                                                   | 8   | U54,U60,U63,U73,U113,U121,U126,U129                                                                                                                                                                                                                                                                                                                                                                            | OPIC PHOTOCOUPLER                                       | SHARP                    |          | PC412S                     | PC412S0NIP0F          |                          |
| 63                                                                                   | 5   | U56-U58,U132-U133                                                                                                                                                                                                                                                                                                                                                                                              | ProASIC 3E FLASH FPGA                                   | ACTEL                    |          | BGA676                     | A3PE1500FG676-I       |                          |
| 64                                                                                   | 1   | U62                                                                                                                                                                                                                                                                                                                                                                                                            | Optical Transciever                                     | AGILENT                  |          | HFBR-5720                  | AFBR-57M5APZ          |                          |
| 65                                                                                   | 1   | U62                                                                                                                                                                                                                                                                                                                                                                                                            | SFP CAGE ASSEMBLY (CAGE COVER)                          | MOLEX                    |          |                            | 73927-0020            |                          |
| 66                                                                                   | 1   | U62                                                                                                                                                                                                                                                                                                                                                                                                            | SFP CAGE ASSEMBLY (CAGE BASE)                           | MOLEX                    |          |                            | 73927-0040            |                          |
| 67                                                                                   | 1   | U62                                                                                                                                                                                                                                                                                                                                                                                                            | PT CONNECTOR ASSEMBLY, 20 POSITION, SFP, 0.8MM          | TYCO ELECTRONICS         |          |                            | 1367073-1             |                          |
| 68                                                                                   | 2   | U89,U98                                                                                                                                                                                                                                                                                                                                                                                                        | DUAL 10-BIT DIGITAL TO ANALOG CONVERTER WITH POWER DOWN | TEXAS INSTRUMENTS        |          | SO8NB                      | TLV5617AID            |                          |
| 69                                                                                   | 2   | U90,U97                                                                                                                                                                                                                                                                                                                                                                                                        | PRECISION MICROPOWER, LOW DROPOUT VOLTAGE REFERENCES    | ANALOG DEVICES           |          | SO8NB                      | REF191ES              |                          |
| 70                                                                                   | 2   | U91,U100                                                                                                                                                                                                                                                                                                                                                                                                       | PARALLEL FIBER OPTIC MODULE- TRANSMITTER                | AVAGO                    |          | AFBR-732B T                | HFBR-772BEZ           | WILL PROVIDE             |
| 71                                                                                   | 2   | U91,U100                                                                                                                                                                                                                                                                                                                                                                                                       | 100 POSITION MEG-ARRAY CONNECTOR                        | FCI CONNECT              |          |                            | 84153-101             |                          |
| 72                                                                                   | 1   | U116                                                                                                                                                                                                                                                                                                                                                                                                           | DUAL 1:5 DIFFERENTIAL CLOCK DRIVER                      | MAXIM                    |          | TQFP32                     | MAX9317AECJ           |                          |
| 73                                                                                   | 2   | U125,U134                                                                                                                                                                                                                                                                                                                                                                                                      | 10-PORT LVDS REPEATERS w/ 100 OHM DRIVE                 | MAXIM                    |          | TSSOP28                    | MAX9153EUI            |                          |
| 74                                                                                   | 1   | U137                                                                                                                                                                                                                                                                                                                                                                                                           | PROGRAMMABLE LVDS OSCILLATOR                            | CARDINAL COMPONENTS INC. |          | CPPV7                      | CPPV7T-BR-125.00      |                          |
| 75                                                                                   | 2   | U165-U166                                                                                                                                                                                                                                                                                                                                                                                                      | QUAD ANALOG SWITCH                                      | ANALOG DEVICES           |          | SO16NB                     | ADG713BR              |                          |
| Total Parts Used: 1584                                                               |     |                                                                                                                                                                                                                                                                                                                                                                                                                |                                                         |                          |          |                            |                       |                          |