

## EEZ PSU Arduino shield+BP BOM (PCB: r3B3, 2016-06-25)

Project source code at <https://github.com/eez-open>

GBP/EUR ratio: 1,2888

| Qty | Value   | Note                      | Parts   | Code    | Farnell<br>Unit<br>price | Total | Code            | TME        |        | Combined |
|-----|---|---------------------------|---|---------|--------------------------|-------|-----------------|------------|--------|----------|
|     |   |                           |   |         |                          |       |                 | Unit price | Total  |          |
| 6   | Arduino Due header<br>1x8-pin, Ethernet<br>header |                           | ADCL, ADCH, Comm,<br>PWML, PWMH, X18  | 1022256 | 0,084                    | £0,50 | ZL201-08G       | 0,074      | 0,44 € | 0,445 €  |
| 2   | 470n  | 1812, 100V                | C105, C110  | 1828961 | 0,676                    | £1,35 | CL43B474KCHNNNE | 0,133      | 0,27 € | 0,265 €  |
| 4   | 10n   | 1206                      | C106, C109, C111, C113  | 1759350 | 0,034                    | £0,14 | CL31B103KBCNNNC | 0,012      | 0,05 € | 0,047 €  |
| 2   | 22u/50V   | Ø6.3 mm                   | C107, C112  | 2326151 | 0,222                    | £0,44 | UWT1H220MCL6GS  | 0,088      | 0,18 € | 0,176 €  |
| 2   | 10u   | 1206                      | C108, C126  | 1759445 | 0,057                    | £0,11 | CSMD10U1206X    | 0,060      | 0,12 € | 0,120 €  |
| 26  | 100n  | 0603                      | C114, C115, C116, C117,<br>C118, C119, C122, C123,<br>C124, C125, C127,<br>C129, C130, C137,<br>C138, C139, C140,<br>C141, C142, C143,<br>C144, C150, C151,<br>C152, C154, C157 | 1759016 | 0,006                    | £0,16 | CL10B104KO8NNNC | 0,006      | 0,15 € | 0,155 €  |
| 1   | 47u   | 16V                       | C120  | 9695664 | 0,191                    | £0,19 | EEEFK1C470UR    | 0,190      | 0,19 € | 0,190 €  |
| 1   | 10u   | 35V                       | C121  | 1850112 | 0,204                    | £0,20 | EEEFK1V100R     | 0,210      | 0,21 € | 0,210 €  |
| 1   | EECS5R5H105                                       | Supercap 5V               | C128  | 9697497 | 2,780                    | £2,78 | EECS5R5H105     | 2,190      | 2,19 € | 2,190 €  |
| 1   | 22n   |                           | C131  | 1759252 | 0,012                    | £0,01 | CL21B223KBANNNC | 0,009      | 0,01 € | 0,009 €  |
| 2   | 18p   |                           | C132, C136  | 2320820 | 0,019                    | £0,04 | CL21C180JBANNNC | 0,010      | 0,02 € | 0,021 €  |
| 2   | 6n8   | 0603                      | C133, C135  | 1759100 | 0,010                    | £0,02 | CL10B682JB8NNNC | 0,004      | 0,01 € | 0,008 €  |
| 4   | 10n   |                           | C134, C147, C155, C156  | 1759246 | 0,011                    | £0,05 | CL31B103KBCNNNC | 0,012      | 0,05 € | 0,046 €  |
| 1   | 10u   | 1206, Tantalum            | C145  | 1457413 | 0,181                    | £0,18 | T491A106K010AT  | 0,084      | 0,08 € | 0,084 €  |
| 1   | 4u7   | 1206, Tantalum            | C146  | 1457428 | 0,159                    | £0,16 | T491A475K006AT  | 0,073      | 0,07 € | 0,073 €  |
| 1   | 47n   |                           | C153  | 1759260 | 0,015                    | £0,02 | CC0805KRX7R9473 | 0,009      | 0,01 € | 0,009 €  |
| 1   | 1u  |                           | C2  | 2320827 | 0,064                    | £0,06 | CL21B105KAFNNNG | 0,011      | 0,01 € | 0,011 €  |
| 5   | BAS316  |                           | D22, D23, D24, D25, D27   | 8734275 | 0,140                    | £0,70 | BAS316          | 0,020      | 0,10 € | 0,101 €  |
| 1   | BAT54S  |                           | D28   | 1843723 | 0,066                    | £0,07 | BAT54S-DIO      | 0,020      | 0,02 € | 0,020 €  |
| 1   | SKL16   |                           | D29   | 1299282 | 0,243                    | £0,24 | SKL16           | 0,095      | 0,10 € | 0,095 €  |
| 1   | Arduino Due header<br>2x18-pin                    |                           | Digital   | 2025426 | 1,510                    | £1,51 | -               |            |        | 1,946 €  |
| 1   | 60R@100MHz  | 0603, Ferrite bead<br>60R | FB8   | 1635704 | 0,033                    | £0,03 | LCBA-600        | 0,027      | 0,03 € | 0,027 €  |
| 1   | TLC5925IDBQR                                      |                           | IC21  | 1694438 | 0,894                    | £0,89 | -               |            |        | 1,152 €  |

# EEZ PSU Arduino shield+BP BOM (PCB: r3B3, 2016-06-25)

Project source code at <https://github.com/eez-open>

|   |                               |                            |  |         |       |       |                 |       |        |         |
|---|-------------------------------|----------------------------|--|---------|-------|-------|-----------------|-------|--------|---------|
| 2 | Si8641EC-B-IS1                |                            | IC22, IC26   | 2423294 | 2,870 | £5,74 | -               |       |        | 7,398 € |
| 2 | Si8651EC-B-IS1                |                            | IC23, IC24   | 2423323 | 2,220 | £4,44 | -               |       |        | 5,722 € |
| 1 | LD1117ADT33TR                 |                            | IC25   | 1087169 | 0,458 | £0,46 | LD1117ADT33     | 0,506 | 0,51 € | 0,506 € |
| 1 | PCA21125                      |                            | IC27   | 2400445 | 1,220 | £1,22 | -               |       |        | 1,572 € |
| 1 | AT25256B                      |                            | IC28   | 1841577 | 0,757 | £0,76 | 25AA256-I/SN    | 1,090 | 1,09 € | 0,976 € |
| 1 | W5500                         |                            | IC29   | -       |       |       | W5500           | 2,660 | 2,66 € | 2,660 € |
| 1 | SN74LVC2G08DCTR               |                            | IC32   | 1470871 | 0,314 | £0,31 | -               |       |        | 0,405 € |
| 1 | TPS3705-33D                   |                            | IC33   | 2296066 | 1,540 | £1,54 | -               |       |        | 1,985 € |
| 1 | SN74LV1T34DBVR                |                            | IC34   | 2499914 | 0,242 | £0,24 | -               |       |        | 0,312 € |
| 1 | SN74LVC2G02DCTR               |                            | IC35   | 1236358 | 0,337 | £0,34 | SN74LVC2G02DCTR | 0,024 | 0,02 € | 0,024 € |
| 1 | Arduino Due socket<br>2x3-pin | 2x3-pin socket             | ICSP   | 7991983 | 0,605 | £0,61 | ZL262-6DG       | 0,066 | 0,07 € | 0,066 € |
| 2 | BS-244DSM-R                   | Binding post 4mm,<br>red   | J1, J4   | 1815818 | 2,120 | £4,24 | BS-244DSM-R     | 1,140 | 2,28 € | 2,280 € |
| 1 | BS-244DSM-G                   | Binding post 4mm,<br>green | J2   | 1815820 | 2,170 | £2,17 | BS-244DSM-G     | 1,140 | 1,14 € | 1,140 € |
| 2 | BS-244DSM-B                   | Binding post 4mm,<br>black | J3, J5   | 1815819 | 2,110 | £4,22 | BS-244DSM-B     | 1,140 | 2,28 € | 2,280 € |
| 1 | 826926-2                      |                            | JP3  | 1248140 | 0,057 | £0,06 | 826926-2        | 0,100 | 0,10 € | 0,073 € |
| 4 | 0R-JUMPA                      | Zero-ohm jumper            | JP4, JP5, JP6, JP7                                   | 9233750 | 0,010 | £0,04 | SMD0805-0R      | 0,059 | 0,24 € | 0,052 € |
| 2 | RT424005                      | Power relay 5V, 8A         | K_PAR, K_SER   | 9950168 | 2,510 | £5,02 | RT424005        | 1,730 | 3,46 € | 3,460 € |
| 2 | G6K-2F-5DC                    | Signal relay 5V, 1A        | K_S1, K_S2   | 4446185 | 2,810 | £5,62 | G6K-2F-5DC      | 2,440 | 4,88 € | 4,880 € |
| 1 | TFT_320QVT                    | 2x20-pin socket            | LCD1   | 7992033 | 2,040 | £2,04 | ZL262-40DG      | 0,322 | 0,32 € | 0,322 € |
| 5 | HSMH-C170                     | Red LED                    | LED_CC1, LED_CC2,<br>LED_PROG1,<br>LED_PROG2, LED_SP | 5790840 | 0,140 | £0,70 | HSMH-C170       | 0,056 | 0,28 € | 0,280 € |
| 4 | HSMY-C170                     | Yellow LED                 | LED_CV1, LED_CV2,<br>LED_S1, LED_S2                  | 5790876 | 0,140 | £0,56 | HSMY-C170       | 0,060 | 0,24 € | 0,240 € |
| 2 | HSMG-C170                     | Green LED                  | LED_O1, LED_O2                                       | 5790852 | 0,150 | £0,30 | HSMG-C170       | 0,095 | 0,19 € | 0,190 € |
| 1 | HSMR-C170                     | Blue LED                   | LED_PWR  | 2497350 | 0,302 | £0,30 | OSB50805C1E     | 0,049 | 0,05 € | 0,049 € |
| 1 | Arduino Due header<br>1x6-pin |                            | POWER  | 1022255 | 0,114 | £0,11 | ZL201-06G       | 0,053 | 0,05 € | 0,053 € |
| 5 | IRLML2246TRPBF                |                            | Q23, Q24, Q25, Q26,<br>Q28                           | 1888166 | 0,099 | £0,49 | IRLML2246TRPBF  | 0,100 | 0,50 € | 0,500 € |
| 3 | 2N7002                        |                            | Q27, Q29, Q30  | 1713823 | 0,038 | £0,11 | 2N7002          | 0,034 | 0,10 € | 0,103 € |
| 8 | 4K7                           |                            | R122, R123, R127,<br>R129, R132, R133,<br>R156, R158 | 9333266 | 0,012 | £0,10 | RC0805FR-074K7  | 0,007 | 0,06 € | 0,056 € |
| 2 | 1R                            |                            | R124, R128   | 2141629 | 0,016 | £0,03 | RC0805FR-071R   | 0,008 | 0,02 € | 0,017 € |
| 3 | 100K                          |                            | R125, R131, R142                                     | 1887334 | 0,017 | £0,05 | SMD0805-100K-1% | 0,008 | 0,02 € | 0,025 € |
| 1 | 1K5                           |                            | R126   | 9332600 | 0,016 | £0,02 | RC0805FR-071K5  | 0,007 | 0,01 € | 0,007 € |

# EEZ PSU Arduino shield+BP BOM (PCB: r3B3, 2016-06-25)

Project source code at <https://github.com/eez-open>

|   |                |                                   |                              |         |       |               |                 |       |                |                |
|---|----------------|-----------------------------------|------------------------------|---------|-------|---------------|-----------------|-------|----------------|----------------|
| 3 | 180R           |                                   | R130, R143, R144             | 2447583 | 0,005 | £0,02         | SMD0805-180R-1% | 0,008 | 0,02 €         | 0,019 €        |
| 4 | 49R9           |                                   | R134, R136, R137, R138       | 2141727 | 0,016 | £0,06         | RC0805FR-0749R9 | 0,007 | 0,03 €         | 0,028 €        |
| 5 | 10K            |                                   | R135, R141, R145, R157, R159 | 9237755 | 0,009 | £0,05         | RC0805FR-0710K  | 0,006 | 0,03 €         | 0,030 €        |
| 1 | 10R            |                                   | R139                         | 2380677 | 0,111 | £0,11         | RC0805FR-0710R  | 0,007 | 0,01 €         | 0,007 €        |
| 1 | 12K4           |                                   | R140                         | 2141850 | 0,010 | £0,01         | -               |       |                | 0,013 €        |
| 2 | 30K            |                                   | R149, R150                   | 9334327 | 0,009 | £0,02         | SMD0805-30K-1%  | 0,008 | 0,02 €         | 0,017 €        |
| 1 | 100R           |                                   | R151                         | 1099793 | 0,024 | £0,02         | RC0805FR-07100R | 0,007 | 0,01 €         | 0,007 €        |
| 1 | 0R             |                                   | R152                         | 9233750 | 0,010 | £0,01         | SMD0805-0R      | 0,059 | 0,06 €         | 0,013 €        |
| 1 | 10K            | 1206                              | R153                         | 2331878 | 0,041 | £0,04         | HP06-10K1%      | 0,016 | 0,02 €         | 0,016 €        |
| 2 | 1K             |                                   | R154, R155                   | 1099800 | 0,024 | £0,05         | RC0805FR-071K   | 0,007 | 0,01 €         | 0,014 €        |
| 2 | 4x10K          | 1206, array                       | RN1, RN2                     | 1770137 | 0,015 | £0,03         | DR1206-10K-4/8  | 0,007 | 0,01 €         | 0,014 €        |
| 1 | LD-BZEN-0903   | Buzzer without built-in generator | SG1                          | -       |       |               | LD-BZEN-0903    | 0,483 | 0,48 €         | 0,483 €        |
| 1 | MC000006       | 8-pin push-in connector           | X12                          | 2007972 | 1,530 | £1,53         | -               |       |                | 1,972 €        |
| 2 | TSW-113-07-F-D | 2x13-pin header                   | X13, X15                     | 2025182 | 1,640 | £3,28         | -               |       |                | 4,227 €        |
| 1 | MC000005       | 6-pin push-in connector           | X14                          | 2007971 | 1,190 | £1,19         | -               |       |                | 1,534 €        |
| 1 | 09185067324    | IDC 10-pin                        | X16                          | 1096984 | 0,745 | £0,75         | T821-1-10-S1    | 0,290 | 0,29 €         | 0,290 €        |
| 1 | 22-23-2021     | 2-pin 0.1" socket                 | X17                          | 1462926 | 0,040 | £0,04         | MX-22-23-2021   | 0,060 | 0,06 €         | 0,051 €        |
| 1 | 22-23-2041     | 4-pin 0.1" socket                 | X19                          | 1462920 | 0,130 | £0,13         | MX-22-23-2041   | 0,009 | 0,01 €         | 0,009 €        |
| 1 | 32,768kHz      | RTC XTAL                          | Y1                           | 2449395 | 0,151 | £0,15         | 32.768K-TC38    | 0,142 | 0,14 €         | 0,142 €        |
| 1 | 25MHz          | Ethernet XTAL                     | Y2                           | 2467741 | 0,206 | £0,21         | 25.00M-SMDHC49S | 0,359 | 0,36 €         | 0,265 €        |
| 2 | SMAJ18A        |                                   | ZD10, ZD11                   | 1749305 | 0,040 | £0,08         | P4SMAJ18A-DIO   | 0,105 | 0,21 €         | 0,103 €        |
| 1 | 4V3            | MiniMELF                          | ZD12                         | 1466545 | 0,023 | £0,02         | BZV55-C4V3.115  | 0,020 | 0,02 €         | 0,020 €        |
|   | P4SMAJ36A      | Model 0-30V                       | ZD8, ZD9                     | 1899455 | 0,186 | £0,19         | P4SMAJ36A-DIO   | 0,105 | 0,11 €         |                |
| 2 | P4SMAJ48A      | Model 0-40V                       | ZD8, ZD9                     | 1749310 | 0,157 | £0,31         | P4SMAJ48A-DIO   | 0,102 | 0,20 €         | 0,204 €        |
|   | P4SMAJ60A      | Model 0-50V                       | ZD8, ZD9                     | 1899460 | 0,098 | £0,10         | P4SMAJ60A-DIO   | 0,105 | 0,11 €         |                |
|   |                |                                   |                              |         |       | <b>£60,09</b> |                 |       | <b>27,07 €</b> | <b>54,51 €</b> |

| Optional |             |                |      |         |       |              |             |       |               |               |
|----------|-------------|----------------|------|---------|-------|--------------|-------------|-------|---------------|---------------|
| 1        | SMBJ5.0A-TR |                | D26  | 2353654 | 0,071 | £0,07        | SMBJ5.0A-TR | 0,089 | 0,09 €        | 0,089 €       |
| 1        | A101SYCQ04  | Toggle switch  | SW1  | 2292959 | 1,960 | £1,96        | -           |       |               | 2,526 €       |
| 1        | 1301.9316   | Tactile switch | SW2  | 1217765 | 0,510 | £0,51        | 1301.9316   | 0,220 | 0,22 €        | 0,220 €       |
| 1        | M20-9980446 | 2x4 pin header | WIFI | 1022233 | 0,138 | £0,14        | ZL202-8G    | 0,064 | 0,06 €        | 0,064 €       |
| 1        | M20-9980546 | 2x5-pin header | X20  | 1022236 | 0,191 | £0,19        | ZL202-10G   | 0,053 | 0,05 €        | 0,053 €       |
|          |             |                |      |         |       | <b>£2,87</b> |             |       | <b>0,43 €</b> | <b>2,95 €</b> |

# EEZ PSU Arduino shield+BP BOM (PCB: r3B3, 2016-06-25)

Project source code at <https://github.com/eez-open>

## Optional (V/F converters for battery temperature)

|   |          |         |            |         |       |              |                 |       |               |               |
|---|----------|---------|------------|---------|-------|--------------|-----------------|-------|---------------|---------------|
| 1 | 100n     | 0603    | C148       | 1759016 | 0,006 | £0,01        | CL10B104KO8NNNC | 0,006 | 0,01 €        | 0,006 €       |
| 1 | 47n      |         | C149       | 1759260 | 0,015 | £0,02        | CC0805KRX7R9473 | 0,009 | 0,01 €        | 0,009 €       |
| 1 | BC857BS  | SOT-363 | IC30       | 1653608 | 0,108 | £0,11        | BC857BS         | 0,027 | 0,03 €        | 0,027 €       |
| 1 | TLC555   |         | IC31       | 9589880 | 0,194 | £0,19        | TLC555CD        | 0,250 | 0,25 €        | 0,250 €       |
| 1 | HCPL-181 |         | OK3        | 1244525 | 0,255 | £0,26        | HCPL-181-000E   | 0,250 | 0,25 €        | 0,250 €       |
| 1 | 180R     |         | R146       | 2447583 | 0,009 | £0,01        | RC0805JR-07180R | 0,060 | 0,06 €        | 0,011 €       |
| 2 | 1K5      |         | R147, R148 | 9332600 | 0,016 | £0,03        | RC0805FR-071K5  | 0,007 | 0,01 €        | 0,014 €       |
|   |          |         |            |         |       | <b>£0,62</b> |                 |       | <b>0,62 €</b> | <b>0,57 €</b> |

## Arduino board

|  |                  |         |        |        |         |        |         |
|--|------------------|---------|--------|--------|---------|--------|---------|
| Arduino Due rev3                               | 32-bit MCU, 3.3V | 2250861 | 32,940 | £32,94 | A000062 | 36,500 | 36,50 € |
| or search for clones on eBay, AliExpress, etc. |                  |         |        |        |         |        |         |

## 3.2" TFT Touch screen with SD-card (TFT\_320QVT)

|   |   |   |        |         |          |
|---|---|---|--------|---------|----------|
| 1 | <b>Option #1:</b> <a href="http://eckstein-shop.de/32-inch-240x320-TFT-with-Touch-panel_1">http://eckstein-shop.de/32-inch-240x320-TFT-with-Touch-panel_1</a>   | - | 14,450 | 14,45 € | 14,450 € |
|   | <b>Option #2:</b> search on eBay, etc. for 3.2" TFT LCD Display Module + Touch Panel +SD Reader (before buy check model name, screen size and resolution, total physical dimension 65x95mm, 40-pin connector and controller type SSD1289) |   |        |         | 14,45 €  |

## Enclosure and mechanical

|    |  |  |     |         |       |       |                |       |        |         |  |
|----|--|--|-----|---------|-------|-------|----------------|-------|--------|---------|--|
| 1  | USB adapter cable                      | Search for <i>micro usb 5pin male to 1x 5Pin Female 0.1" USB</i> (e.g. <a href="http://www.aliexpress.com/store/product/Free-Shipping-50CM-micro-usb-5pin-male-to-1x-5Pin-Female-0-1-USB-header-PCB/1171008_32233605468.html">http://www.aliexpress.com/store/product/Free-Shipping-50CM-micro-usb-5pin-male-to-1x-5Pin-Female-0-1-USB-header-PCB/1171008_32233605468.html</a> ) |     |         |       |       |                |       |        |         |  |
| 2  | NSR-08                                 | Plug; female; PIN:8<br>w/o terminals for Ethernet cable  | -   |         |       |       | NSR-08         | 0,086 | 0,17 € | 0,171 € |  |
| 1  | NSR-05                                 | Plug; female; PIN:5<br>w/o terminals for USB cable   | -   |         |       |       | NSR-05         | 0,026 | 0,03 € | 0,026 € |  |
| 21 | NDR-T                                  | Contact; female;<br>28÷22AWG;<br>NSR/NDR; tinned   | -   |         |       |       | NDR-T          | 0,026 | 0,55 € | 0,554 € |  |
| 9  | Screwed spacer sleeve; M5; 8mm; brass  | Extend binding post for PCB mounting   | n/a | -       |       |       | TFM-M5X8/DR218 | 0,187 | 1,68 € | 1,681 € |  |
| 4  | Spacer sleeve; 5mm; cylindrical; brass | 5 mm between TFT display and front panel   | n/a | 1733405 | 0,065 | £0,26 | DR316/3.2X5    | 0,057 | 0,23 € | 0,228 € |  |

**EEZ PSU Arduino shield+BP BOM (PCB: r3B3, 2016-06-25)***Project source code at <https://github.com/eez-open>*

|    |   |                                      |     |         |       |       |           |       |        |         |
|----|---|--------------------------------------|-----|---------|-------|-------|-----------|-------|--------|---------|
| 4  | Screwed spacer sleeve; hexagonal; polyamide; M3 | 11 mm between TFT display and PCB    | n/a | 2494576 | 0,238 | £0,95 | TP-11     | 0,128 | 0,51 € | 0,512 € |
| 4  | Plastic washer; round; M3                       |                                      |     | -       |       |       | B3/BN1074 | 0,008 | 0,03 € | 0,032 € |
| 11 | Light pipe for LED                              | Round; Ø3mm; Front: convex; straight | n/a | 2293496 | 0,362 | £3,98 | PLP2-625  | 0,486 | 5,35 € | 5,132 € |
|    |   |                                      |     |         |       |       |           |       | 8,55 € | 8,34 €  |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |
|    |   |                                      |     |         |       |       |           |       |        |         |