

## MyRIO Expansion Board

(Gamma2a, 2018)

| Name              | Value               | Package                      | Description  | Part Number   |
|-------------------|---------------------|------------------------------|--|---|
| C1, C2, C3        | 220 uF (50V)        | Radial                       | Buckpuck cap   | P5183-ND  |
| C4, C5, C8, C9    | .1 uF?              | 0805                         | LP filter  |   |
| C6                | .1 uF               | Radial                       | Vreg output cap  |   |
| C7                | .33 uF 50V          | Radial                       | Vreg input cap   |   |
| C10               | .1 uF               | 0805                         | Comparator bypass cap  |   |
|                   |                     |                              |  |   |
| D1                | 2A, 200V            | Through hole                 | Input reverse polarity protection diode                                      | <a href="#">RL203-TPCT-ND</a>   |
| <del>D2, D3</del> | <del>1A, 100V</del> | <del>SMB</del>               | <del>SB1100 solenoid flyback Schottky diode</del>                            | <del><a href="#">MBRS1100T3GOSCT-ND</a></del>                         |
| D2, D3            | 3A, 60V             | SMB                          | Fast recovery Schottky diode for coils. MBR360                               | <a href="#">MBRS360BT3GOSCT-ND</a>                                    |
| <del>D4, D5</del> | <del>40V</del>      | <del>SOT23</del>             | <del>Lick FET Protection Schottky diode</del>                                | <del><a href="#">BAS40-04-E3-08CT-ND</a></del>                        |
| D4, D5            | 40V                 | SOT23                        | Upgraded lick FET Protection Schottky diode array with higher Vr max         | <a href="#">CMPD2004SCT-ND</a>  |
|                   |                     |                              |  |   |
|                   |                     |                              |  |   |
| Q1, Q3            | 500mA, 60V          | SOT23                        | MMBF170 NFET for lick detection  | <a href="#">MMBF170CT-ND</a>  |
| Q1, Q3            | 500mA, 60V          | SOT23                        | Improved NFET for lick detection with higher VDS max                         | <a href="#">DMN24H3D5L-7DICT-ND</a>                                   |
| Q2, Q4            | 200mA, 40V          | SOT23                        | 2N3906 PNP for lick detection  | <a href="#">MMBT3906FSCT-ND</a>                                       |
| Q5, Q7, Q9        | 200mA, 40V          | SOT23                        | 2N3906 PNP for Buckpuck ctrl   | <a href="#">MMBT3906FSCT-ND</a>                                       |
| Q6, Q8, Q10       | 200mA, 40V          | SOT23                        | 2N3904 NPN for Buckpuck ctrl   | <a href="#">568-4510-1-ND</a>   |
| T1, T2            | 60V, 4A             | SOT-223                      | Power NFET for soln. Alternate part with better characteristics (protection) | <a href="#">497-3177-1-ND</a><br><a href="#">NCV8406ASTT1GOSCT-ND</a> |
|                   |                     |                              |  |   |
| R1, R3, R38, R42  | 10M                 | 0805                         | Lick sense resistor  | <a href="#">HMC0805JT50M0CT-ND</a>                                    |
| R2, R4            | 500                 | 1206                         | Soln FET gate drive  |   |
| R30, R31          | 50k                 | 1206                         | Soln FET pull-down   |   |
| R32, R33          | 1                   | 1206                         | Soln current sense   |   |
| R7                | 500                 | axial                        | Power LED  |   |
| R8, R15, R19, R20 | 500                 | 0805                         | Opto-isolator LED current limit  |   |
| R5, R6, R17, R18  | 100k                | 0805                         | First lick sensor components   |   |
| R16, R21          | 100k Pot            | Bourne 3362P or 3386P Series | First lick sensor components, sensitivity adjust                             | <a href="#">3386P-104LF-ND</a><br><a href="#">3362P-104LF-ND</a>      |

|  |                        |         |  |  |
|--|------------------------|---------|--|--|
| R9, R10, R11, R12, R13, R14, R24, R27, R29 | 5k                     | 0805    | Buckpuck control   |  |
| R23,R26                                    | 1M                     | Trimpot | Hysteresis adjust  |  |
| R22, R25, R28, R34                         | 10k                    | 0805    | Lick sensor LP   |  |
| R35, R39                                   | 30k                    |         | Comparator output pull-up  |  |
| R36, R37, R40, R41                         | 100k                   |         | Comparator lick circuit  |  |
|  |                        |         |  |  |
|  |                        |         |  |  |
| OK1-OK4                                    | Opto isolator          | 6-SMD   | 4N25SM   | <a href="#">4N25SM-ND</a>  |
| U1   | TVS                    | SOT-143 | TVS Protection diode for lick FETs   | <a href="#">CD143A-SR12CT-ND</a>   |
| U2   | Comparator             | 14-SOIC | LP339 open collector, 4 device. Can probably use LM339 or other comparator | <a href="#">296-14609-1-ND</a><br><a href="#">296-6604-1-ND</a>  |
| U3   | 5V LDO Regulator       | DPAK    | MC78M05  | <a href="#">497-7255-1-ND</a>  |
|  | Right Angle BNC Double |         |  | <a href="#">ARF2111-ND</a><br><a href="#">ACX2286-ND</a>   |
|  | Right Angle BNC        |         |  | <a href="#">A97553-ND</a> ,<br><a href="#">WM5514-ND</a>   |
|  | NI MXP Connector       |         |  | <a href="#">S9207-ND</a>   |
|  | Audio jack             |         |  | <a href="#">CP1-3525N-ND</a>   |
|  | DC Barrel Connector    |         |  | <a href="#">EJ503A-ND</a>  |
|  | Switch SPDT            |         | EG2478   | <a href="#">EG1906-ND</a><br><a href="#">EG2478-ND</a>   |
|  | Switch 3PDT            |         | To select battery power.   | <a href="#">CKN1526-ND</a><br><a href="#">CKN1525-ND</a><br><a href="#">360-3209-ND</a><br><a href="#">563-1651-ND</a> |
|  |                        | 14-SOIC | CD40106B Schmitt Trigger for lick sense                                    | <a href="#">296-14081-1-ND</a>   |
|  |                        | 8-SOIC  | LT1490A Op-amp for lick sense  | <a href="#">LT1490ACS8#PBF-ND</a>  |
|  |                        | SIP-7   | Buckpuck 350 mA, internal current adjustment pot                           | <a href="#">788-1098-ND</a>  |
|  |                        |         |  |  |
|  |                        |         |  |  |

#### Notes:

1. Replaced Q1, Q3 NPN with BS170 nFETs. Several have died, likely due to static. Need protection diodes
2. Improve labeling on led BNC terminals.
3. Upgraded Q1, Q3 to DMN24H3D5L (240V) and upgraded protection diodes to CMPD2004S (240V). Later upgraded to TVS data line ESD protection via CD143A

#### ToDo:

- ~~1. Revise part #s~~
- ~~2. Spread out lick detection circuit~~
- ~~3. Add John's lick detection circuit with threshold adjust?~~
- ~~4. Shift RIO connectors by ~1.2mm~~
- ~~5. Bigger ampacity on/off switch~~
- ~~6. Move audio connectors~~
- ~~7. Shift Schottky diodes left, put labels on solenoid connectors. Include Soln voltage markings.~~

### **Version History:**

#### **Gamma**

1. Protection diodes on Fet gates
2. Alternate lick detection circuit included
3. Power transistors for solenoid actuation
4. Included switch and indicator to select lick circuit power/isolation