CHAMELEON

FREE/FREE+/BeFREE Module with LCD Keys

TECHNICAL OVERVIEW

Description and Application

Chameleon_TO_6_1.doc
Version 6.1
December 15, 2014

TIPRO®

TABLE OF CONTENTS

A. GENERAL INFORMATION

The **Chameleon** is an add-on module of the modular FREE/FREE+/BeFREE (also referred to as **FREE**) family which combines 16 LCD keys with 12 standard mechanical keys. It can be pictured as a keyboard that dynamically changes its appearance (key inscriptions and backlight colours) and function (key codes). This "chameleon like" self-changes follow either predefined page structures (Off-Line Operating Mode) or commands received from the host system (On-Line Operating Mode).

Integrated LCD keys are push-button keyswitches with built-in graphic display. A liquid crystal display is integrated within the key. The resolution of the display is 32 x 16 pixels. Each pixel can be turned on or off individually, allowing the display of two lines of text or detailed graphics.

Furthermore, LED background lighting is integrated in the display, which makes the displayed graphics readable in dark operating environments. An additional advantage of the background lighting is the ability to notify the operator. Different operating conditions can be indicated by different colours. The alerting effect can be improved by alternating (blinking) backlight colours using several predefined rates.

A.1. Highlights

APPLICATIONS

- dispatcher terminals
- banking & trading consoles
- multifunctional control panels
- industrial controls

CONCEPT AND MODULARITY

- ergonomic and intuitive human interface device
- combination of standard mechanical keys for quick data entry and self-explanatory LCD keys (32 x 16 pixel graphic LCD that clearly displays the key function)
- different steady and alternating background colours for grouping or emphasizing keys and their functions
- intuitive user guidance through a menu system
- positive feedback that a function has been performed
- combinable with other **FREE** add-on modules (e.g. touchcomputers, touchmonitors, voice communication modules, keypads …) into multifunctional terminals

- stand-alone operation - in this case the respective Tipro USB controller should be integrated-in (alternatively, for legacy applications, Tipro PS/2+RS232 controller is also available)

PROGRAMMABILITY

- all keys are programmable
- programmable inter-byte and inter-character delay
- key-click function
- quick integration into existing application software

VERSATILITY

- off-line and on-line operating modes
- several interfacing options

A.2. Technical Characteristics

ELECTRICAL

- **power supply (LCD keys)**: 5V ± 5% (via Tipro Power Bus from Powered FREE+ Touchmonitor or BeFREE Touchcomputer or alternatively from an external power supply, e.g. TM-VPA)
- **power supply (the rest of electronic circuitry)**: 5V ± 5% (via Tipro bus)
- **current consumption (LCD keys)**: up to 1000 mA (400 mA$_{TYP}$), depending on selected backlight colours
- **current consumption (the rest of electronic circuitry)**: 20 mA$_{TYP}$
- **communication interface**: TIPRO bus
- **interface connectors:**
  - **left-hand side connector:** 6-pin Micro-MaTch header (male) at the end of the 100 mm long ribbon cable
  - **right-hand side connector:** 6-pin Micro-MaTch receptacle (female) on the PCB
  - **middle connector:** 6-pin header (male) on the PCB for the Controller connection

MECHANICAL

- **casing**: plastic ABS, black colour – C15
- **net dimensions**: 138 x 222 x 46 (W/D/H) [mm]
- **gross dimensions** (with side-covers): 158 x 222 x 46 (W/D/H) [mm]
- **weight**: 650 g (approximately)
- **protection (sealing) grade**: IP 40 (according to EN 60529)

ENVIRONMENTAL

- **operating ambient temperature range**: 0°C to +40°C
- **storage ambient temperature range**: -10° C to +50°C
- **relative humidity range**: 20% to 80% (non-condensing)

LCD KEYS

- **graphic LCD**
  - resolution: 32 x 16 pixels
  - pixel area: 17.26 x 12.14 (W/H) [mm]
  - pixel size: 0.52 x 0.74 [mm]
- **backlighting**
  - up to 64 different RGB colours
- **keyswitch**
  - key travel: 2.5 mm (± 0.1 mm)
  - actuating force: 1.3 N (± 0.2 N)
  - operating life: 3 million operations

MECHANICAL KEYS

- **keyswitch**
  - model: Cherry MX
  - key travel: 3.6 mm to 4.0 mm total, (2 ± 0.6) mm pre-travel
  - actuating force: (60 ± 20) cN
  - reliability (Mean Cycles To Failure): MCTF = 1 billion (10^9) press/release cycles (50 million is guaranteed minimum)
- **keycaps**
  - construction: separate body and cover
  - size: single
  - keycap bodies: CN15 black colour
  - keycap covers: transparent
  - key legends: paper legends (underneath transparent keycap covers)

A.3. Operating Modes

Chameleon can dynamically change its appearance and function. Those "transformations" can be controlled either from within the module (Off-Line Operating Mode) or from the host system (On-Line Operating Mode).

The module incorporates non-volatile memory (Flash, 1 Mbit capacity, 10 000 write cycles minimum, 10 years data retention) for permanent storage of user-defined settings. The memory is divided into two major parts. The first one is a library of up to 256 icons (bitmaps) to be displayed on LCD keys and the other one is the application area describing the required operation. The application area is divided into up to 24 "pages". Each page describes properties of all 16 LCD keys that are simultaneously active. The properties are:

- Graphics to be displayed on the LCD (i.e. pointer to one of 256 predefined icons within the library)
- Normal (black on white) or reversed (white on black) graphics
- Two backlight colours (Colour 1 and Colour 2) to be alternated by required blinking rate (also referred to as alternating frequency). Colour 1 and Colour 2 can be selected from the palette of 64 different colours, plus "no colour" when backlight is turned off.
- Backlight alternating frequency (2.0 Hz, 1.0 Hz, 0.5 Hz and 0 Hz) between Colour 1 and Colour 2. If the frequency is set to zero, it means steady backlighting in Colour 1.
- Sequence of codes to be sent towards the host system upon key press and/or key release.
- "Change Page" action upon key release: Page Up, Page Down, Home, End, Go To Page No, Stay In Actual (Don't Change)

All the properties can be independently defined for each of the 16 LCD keys within each of up to 24 pages. In total, up to 24 x 16 = 384 different settings are allowed.

This "page structure" is applicable exclusively for 16 LCD keys. 12 mechanical keys are treated separately and their properties are constant no matter which page is currently active. Properties of mechanical keys are:

- Sequence of codes to be sent towards the host system upon key press and/or key release. Up to 4 different sequences can be defined for each key (which differs from LCD keys with single sequence per key).
- "Change Page" action upon key release: Page Up, Page Down, Home, End, Go To Page No, Stay In Actual (Don't Change)

All above settings for LCD keys and mechanical keys are user definable by means of "ChangeMe" software utility operating under Windows operating systems.

A.3.1. Off-Line Operating Mode

This is the default operating mode, also referred to as "Stand-Alone" operation. Once all the settings are defined and stored within the module's non-volatile memory, the module is ready for Off-Line operation. After the power-on it loads the Home Page (Page 0) and waits for a keystroke. The module itself, by means of predefined "Change Page" actions, navigates through the pages (i.e. switching between different keyboard layouts).

A.3.2. On-Line Operating Mode

In On-Line mode (also referred to as "Real-Time" operation) the host system controls what is currently displayed on LCD keys. The module can execute the following set of commands received from the host:

- **Go On Line**
  The module will switch to On-Line operating mode (until reset or new power-on condition), load the Home Page properties and disable "Change Page" actions for both LCD keys and mechanical keys.
- **Display Icon**
  The module will display selected icon from the library on the addressed LCD key.
- **Display Bitmap**
  The module will display required bitmap (passed as the command arguments to the module) on addressed LCD key.
- **Change Backlighting**
  The module will set required backlighting (Colour 1, Colour 2 and blinking rate) for the addressed LCD key.
- **Go To Page**
  The module will load the selected page (**n**). Page number (**n**) should be within the range from 0 up to (**N**-1), where the **N** is total number of preprogrammed pages.
- **Get Page Number**
  The module will return the actual page number (**n**) and total number of pages (**N**).
- **Go On Line Permanently**
  The module will remain in On-Line mode even if the power is removed, so the On-Line becomes default operating mode.
- **Return Off Line Permanently**
  The module will recover factory-preset default operating mode.

A.4. Power Consumption

Current consumption of the Chameleon, depending on selected backlighting colours, may exceed 500 mA, what is the limit of USB computer ports. Therefore, an additional

+5V power supply (e.g. TM-VPA) is compulsory, except in cases when the Chameleon module is used within a configuration comprising a Powered FREE+ touchmonitor or a BeFREE touchcomputer.

B. ORDERING CODES

B.1. Module

	1	2	3		4		5
T M -	**L**	**R**	**X**	**-**	**C15**	**-**	000

1 – Module Type

L –Chameleon (**L**CD keys)

2 – LCD Keys

R – LCD keys 32 x 16 pixels

3 – Key Matrix Arrangement

X – **X**Y matrix

4 – Housing Colour

C15 – black

5 – Custom Version

Three-digit number reserved for product customizations. It is omitted in case of standard version.

B.2. Stand-Alone Version (Configuration)

1	2	3	4	5		6		7
T	**M**	**C**	**-**	**L**	**M**	C	**V**	- **C15** - 000

1 – C – **C**onfiguration – Complete Device

2 – L – Chameleon Module

3 – M – Integrated Controller (**M**aster) Module

4 – C – Interface **C**ables Included

5 – V – Side Covers (End Caps) and/or AC/DC Adapter (Power Supply) Included

6 – Housing Colour

C15 – black is the standard colour

7 – Custom version

Three-digit number reserved for product customizations. It is omitted in case of standard version.

C. REFERENCES

1. “BeFREE 10” - Technical Overview
2. “BeFREE 15” - Technical Overview
3. “SPEAKERBOX” – Technical Overview
4. “HANDSET” – Technical Overview
5. “POWERED FREE+ 15” – Technical Overview
6. “ChangeMe” – User’s Manual
7. “Modularity Demystified” – “Dispatching Hints & Tips” White Paper – Issue No. 001

D. NOTICES

D.1. Disclaimer

Information furnished by Tipro is believed to be accurate and reliable. However, Tipro makes no representations or warranties regarding the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice.

D.2. Copyright Notice