



Kensington®

Product Engineering Specification

K33441 ET-CLA

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Revision History

Modified By	Date	Revision	Reason for Change
Matt Hoag	January 11, 2008	0.1	First Draft
Gary Wong	January 22, 2008	0.2	Detail BT behavior
Matt Hoag	March 3, 2008	0.3	iPhone & TDMA scheme
		1.0	Released
		1.1	Modified
		1.2	Modified

Product Information

Product Name	Codename: ET -CLA
Product Description	CLA mounted BT Handsfree kit
Product Number	K33441
Product Manager	Kevin Ngo
Project Manager	Matthew Hoag

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1.0 Introduction

ET- Visor is a Bluetooth enabled automotive speaker phone which is mounted at the vehicle's CLA power port. The controls on the product & the pairing process are "Smart Made Simple"

.....



Figure 1 – Preliminary product images

1.1 Scope

This document outlines the Electrical Specifications, ID Considerations, Mechanical Specifications and Tooling Requirements necessary to produce the product.

1.2 Purpose

1.3 Reference

- a) *Product Requirement Document, V1*
- b) KTG-QA-G005-03 – Kensington Environmental Test Specification, April 18, 2007, Revision 0.3
- c) *Other reference documents*

1.4 Acronyms

Table 1 - Acronyms

Acronym	Description
ESD	Electrostatic Discharge
EMC	Electro Magnetic Compatibility
FCC	Federal Communication Commission

2.0 Functional Specifications

2.1 General Description

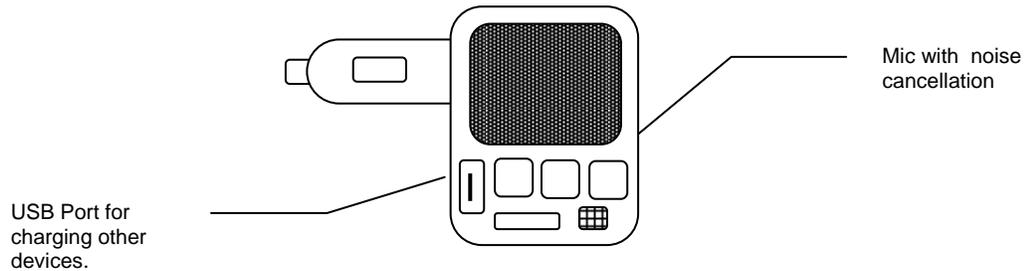
ET is a hands free speakerphone that allows a user to answer/make a phone call without needing to access the phone itself through Bluetooth. The unit is powered via the vehicle's CLA 12V Power port.

2.2 System Diagram

ET CLA BT Handsfree

Major components;

- BC05 BT Module
- Li-Ion Charging Circuitry
- iPhone charging circuitry in USB Port
- Speaker
- Mic with Noise cancellation
- Volume slider



2.3 Button Functions

1. -Speed dial buttons: x 3
 - a. -When on a call, if the user presses & holds a speed dial button, the number for that call is stored in memory.
 - b. -When not in a call, if the user briefly presses the speed dial button, that number will be dialed by the cell phone and the call will be connected to the BT handsfree kit.
 - c. If an incoming call is from one of the Speed dial numbers, the LED behind the speed dial button will flash.
2. -Call/Answer & -Call End (One button)
3. -Volume slider (rheostat)
4. -Power
5. -Pair (recessed) / Driver Swap
 - a. Press and hold to start pairing process with a new phone.
 - b. Quick press to disconnect from currently paired phone & attempt to reconnect with the next phone in the buffer.

See interface specification for more detailed description of button functions & actions.

2.4 Display Functions

Indicators LEDs

- Power on / Low power
- Pairing Mode/ Paired
- Speed dial Presets (3x)

See interface specification for more detailed description of button functions & actions.

3.0 Electrical Specifications

This product is a basic BT-Handfree kit which is power directly from an automotive CLA power port. This product will be approved under Apples Works with iPhone Program. This program requires:

-Automotive chargers for iPhone must meet very specific specifications for the power supplied and must show a resilience to power surges.

-Products with speakers must show that they do not pick up the TDMA interference from an iPhone & amplify it within the speaker

3.1 General Description

3.2 Interface Description



interaction_101207_
flowchart.pdf

3.3 Power Requirements

Must be powered by 10-14V

-Plugs into 12V power socket of car

-Fused 2AMPS SMT Quick burn

-Includes USB Power circuit which meets the following iPhone 5V power requirements

(Kensington will provide proven reference design to meet these requirements:

In order to reduce PCB space an SMT type fuse it to be used, rated to 2 Amps.

- The CLA power is to drive the electronics on ET and also provide 500mA – 5volt power to the USB port.
- The CLA power supply for the USB shall meet the following technical requirements:
 - a. Input Surge
 1. While the circuit is operating at MAX load and Min load the line voltage is switched to the surge voltage
 - a. 12Vdc to 40Vdc for 16msec, back to 12Vdc. Repeated 5 times at 50% duty cycle
 2. There shall be no component damage, Voltage / logic signals shall remain within specified limits, No loss of performance and no permanent damage.
 - b. Identity line Signals (USB)
 1. With no load on the circuit measure the voltages on D+ and D-
 2. The voltage must fall within the below limits
 - a. D+ : 1.91V to 2.12V
 - b. D-: 1.91V to 2.12V
 - c. Load / Line / Regulation
 1. While the load on one output is increased in steps to a predetermined table, the output voltage deviations are noted. Test is repeated for different input voltages
 2. Output Voltage range
 - a. Vmin=4.85v

- b. $V_{nom}=5.0v$
- c. $V_{max}=5.25v$

Input Voltage (Vdc)	Regulation (V)				
	0.0A	0.25A	0.50A	0.70A	1.0A
10V				Na	Na
12V				Na	Na
14V				Na	Na

d. Dynamic Line Response

1. The PSU is subject to a +2Vdc line variation. The output loads are chosen to give the worst case condition. No load capacitors shall be used.
2. The PSU should not undershoot or overshoot beyond the regulation limits (4.85Vmin, 5.25 Vmax)

e. Turn off/on Characteristics

1. All timing are to measured with a 5uF capacitive loading and 12V DC input voltage.
 - a. Turn-on delay after DC input applied: $T_1 < 4.0$ sec at which point the output voltage must have stabilized between 4.85 and 5.25 V DC.
 - b. Output rise time (10% to 90% regulation): $T_2 < 20ms$
2. All parameters must be within specification
 - a. The output voltage overshoot upon the application or removal of the input voltage shall be less than 10% above the nominal voltage.
 - b. There must be a smooth and continuous ramp of the DC output voltage from 10% to 90% of its final set point within the regulation band, while loaded as specified in section 3.3.b. No voltage of opposite polarity shall be present on any output during turn-on or turn off.

f. Fuse Protection

1. A fuse must be present at the input of the circuit so as to protect the circuit under any fault condition.

g. Short Circuit

1. A short circuit is defined as less than 0.01 Ohm resistance between the output terminals. The PSU is submitted to a short circuit at minimum load
2. The output shall Hiccup or Foldback if any of the outputs are shorted to the secondary common. No damage shall result. Output shall recover after the short is removed.

h. Overcurrent:

1. The load is increased on one output from its maximum value to an estimated over current value in several steps at a rate of 0.1 A/sec. The test is repeated at different input voltages.
2. Overload currents applied to each tested output rail will cause the output to trip before they reach any point of damage to the circuit. For testing purposes the overload currents should be ramped at a minimum rate of 0.1 A/sec starting at full load.
3. The limit during overload condition also applies to any single fault condition.

3.4 BT Requirements

Chipset: CSR BC05

BT 2.1

Up to 8 Paired devices. One at a time

3.5 Audio Requirements Echo & Noise Cancelling

- Audio Out: Speaker
 - Power (minimum) : 1W continuous, 2W peak.
 - Sensitivity (SPL): min 82 +/- 3dB
 - Impedance: 8 Ohm +/- 15%
 - Lowest resonant frequency [Fo]: 280 – 480 Hz
 - Effective frequency Range (minimum): Fo – 10kHz
 - THD < 3%
- Audio In: measurement method tbd
 - Generally the intent is to filter out all external noise factors including but not limited to:
 - Road Noise
 - Car Noise
 - Wind Noise
 - Tire Noise
 - Echo
 - Other ambient noises
 - The prime audio solution (firmware based) for ET will be provided by Primax
 - Echo rejection: >42 dB
 - Convergence in presence of back ground noise: < 1.0 sec
 - Noise Cancellation: 12 dB
 - No Distortion or speech clipping
 - Comfort noise injection for natural sounding conversations
 - Enhanced Non-linear processor for suppression of residual echo
 - Microphone:
 - Omni directional microphone to be used
 - To be isolated via a rubber “boot” to prevent vibration transmission
 - Not to be rigidly mounted to the PCB, should be mounted to the plastics and attached to the PCB via flying leads
 - RF filtering a must to reduce TDMA noise issues
 - 6mm diameter microphone to be used
 - Microphone SNR to be min 55 dB
 - The microphone is to be located on the front face plate for optimum user orientation.
 - Sensitivity greater than -45 dBV at 1KHz
 - Reference Microphone:
 - Kingstate Microphone with flying leads.
 - KECC2244WBL-G9U

3.6 Audio Requirements TDMA Noise

- ET-CLA must include significant defences against TDMA noise generated by the iPhone. TDMA noise from the iPhone must not be transmitted to the user via the speaker on the ET-CLA. The TDMA noise is tested by following the test procedure written in the iPhone accessory specification R4.
- TDMA noise test is done by playing the Apple 1000Hz test tone from a BT enabled source through the speaker of ET-CLA so that a defined SPL is measured. The tone is then played at that volume setting while loading a web page (www.apple.com) on the iPhone using the EDGE network. The iPhone is connected to ET-CLA via USB charging cable. This test must be completed in an Audio lab with a noise floor of 30dB or less. A microphone is connected to a laptop via an external USB sound card & Spectraplus records the combined 1000Hz tone & any resulting TDMA noise. The resulting audio image from the speaker is analyzed and the signal to noise ratio between the 1000 Hz tone and the TDMA must be greater than -70 dB.
- Kensington has designed audio circuits to be resilient to TDMA noise in the past. In general it is necessary to correctly shield the audio cables and properly isolate the audio ground plane from any traces which may act as antennae and any ground planes that are directly connected to the iPhone. Details of past successful design strategies and a reference design will be provided by Kensington.

4.0 Mechanical Specifications

Describe product mechanical specifications in this section, such as product Industrial Design, dimension, mechanical construction design, mechanical components design and assemble, product housing, color and finish, and so on. 3D design images are preferred to show the details of the design. You may add sub-sections as needed.

4.1 Industrial Design Considerations

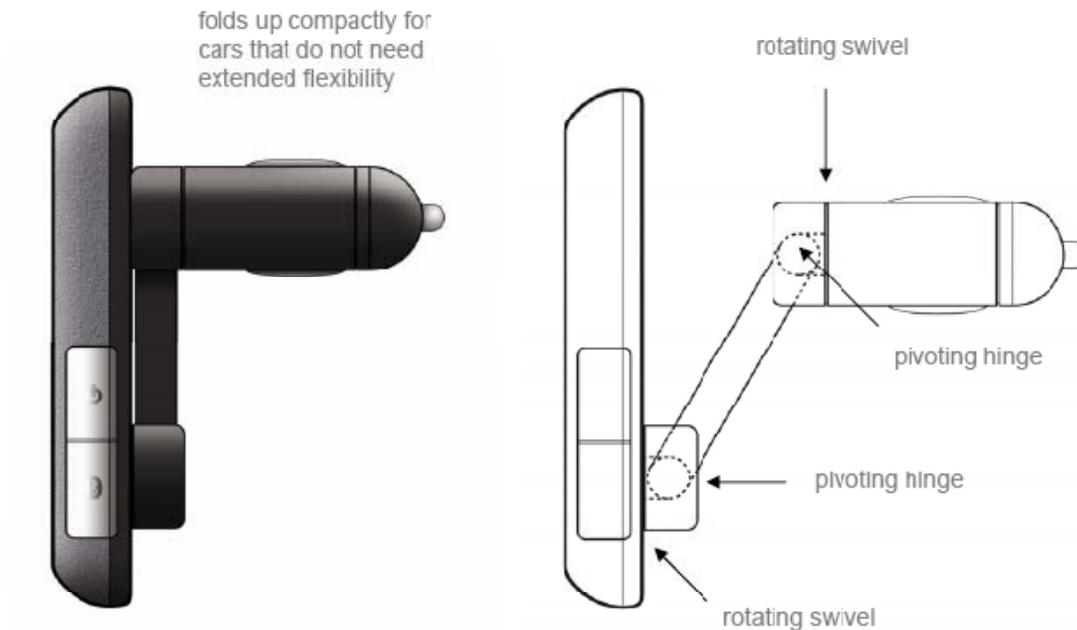
4.1.1 Usability

4.1.2 Logos and Other Markings

4.2 Component and Assembly Specifications

Mechanism for allowing the user to orient the speaker towards them.

Rotating swivels and pivoting hinges must include “detents” so that speaker will remain in position even when subjected to the vibrations that are commonly experienced in automobile when it hits a large bump on the road.



4.3 Bill of Materials

For a detailed Bill of Materials refer to the document BOM-KXXXXX-RX

4.4 Material Specifications

4.5 Tooling Specifications

4.6 Compliance and Recycling Requirements

4.7 Product Labelling Requirements

5.0 Software Specifications

5.1 General Specifications

N/A

5.2 Compatibility Requirements

Mobile phones supporting Bluetooth 2.0 specification and Handsfree or Headset profiles.

5.3 Installation Requirements

N/A

6.0 Product Packaging, Labelling and Documentation

Describe product packaging, labelling and documentation requirement in this section. You may add sub-sections as needed. In this section, you may need to specify the specifications for packaging material, provide the BOM of the packaging and photos or drawing of the assembly components of the packaging. You may also need to specify the requirement of using Kensington Logo and product labels on packaging.

6.1 Packaging Name

6.2 Box Structure Materials Specifications

6.3 Bill of Materials of Packaging

6.4 Sample Photo of Prior Design



K33408.ppt

6.5 Sample Photo and/or Drawing of ALL die cut components

Insert photos and/or drawings here.

6.6 Sample Photo and/or Drawing of Assembly of all Component parts

Insert photos and/or drawings here.

7.0 Environmental Specifications

This product shall comply with, at least but not limited, the environmental specifications selected in this section.

Please refer to the reference b) which is the “KTG-QA-G005-xx – Kensington Environmental Test Specification” document for the details of each test case. The ‘xx’ here means the latest revision of this document.

Environmental test cases selection table

Test Case No.	Test Case Name	Mandatory Test	Optional Test	Comments
1	Drop test without package	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2	Drop test with package	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3	Vibration test without package	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4	Vibration test with package	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5	Shock without package	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
6	High temperature (operating) test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7	Low temperature (operating) test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8	Thermal shock test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
9	High temperature (storage) test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
10	Low temperature (storage) test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
11	Humidity cycling (storage) test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
12	Switch life cycle test	<input type="checkbox"/>	<input type="checkbox"/>	
13	Key/Button life cycle test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
14	Scroll Wheel life cycle test	<input type="checkbox"/>	<input type="checkbox"/>	
15	Battery cover/door endurance test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
16	Insert parts endurance test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
17	Cable bending strength test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
18	Cable pull strength test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
19	Cable and part joint strength test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
20	Paint surface chemical resistance test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
21	Paint surface abrasion test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
22	Paint surface adhesive ability test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
23	Surge voltage test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
24	Supply voltage fluctuation test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
25	Reverse voltage test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
26	ESD test (Direct Discharge)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
27	ESD test (Indirect Discharge)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
28	ESD test (Actual Use)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Note:

- Mandatory Test: tests must be conducted on this product.
- Optional Test: tests are optional to this product.

8.0 Regulatory Requirements

8.1 Region Regulatory Requirements

Product manager shall select the corresponding marketing area for this product to insure that region regulatory compliance requirements are met for the following target markets.

Project managers shall request contract manufacturers to complete the [Product Compliance Certification Summary KTG-QA-S001](#) by the end of the final design stage.

- Africa - List countries: _____
- Asia - List countries: _Hong Kong, Japan, Malaysia, Singapore
- Australia
- Canada
- Europe - All European Union countries requiring CE mark
- Europe – Other Non European Union countries - List countries: _____
- South America - List countries: _____
- USA
- Mexico
- Middle East - List countries: _____
- Russia
- Other countries: _____

8.2 Environmental & Energy Compliance Requirements

Please select from the following list for the Environmental & Energy Compliance required for this product. If there is other requirement, please add description below.

- RoHS Directive 2002/95/EC (Europe)
- WEEE Directive 2002/96/EC (Europe)
- Energy Star (USA)
- Lead-Free (USA)

8.3 OEM Specific Requirements

- Dell Specific Requirements
- HP Specific Requirements
- Apple Specific Requirements
- Other, *please specify ...*

9.0 Quality Requirements

Please describe the quality requirement for this product below. The example subsections are given as a reference. Author may change these subsections or add more requirements according to the corresponding product.

9.1 Design Workload

This product is designed to be capable of operating 24 hours a day, 365 days a year under the specified environmental conditions defined in section 7.1 and 7.2.

9.2 Reliability Requirements

The reliability of this product shall be measured by MTBF (mean time between failures). It is the average time that this product is being used under its specific operating conditions before a failure occurs since last failure happened. It is measured in hours.

The MTBF of this product is > ?????? hours.

Note: The MTBF value is related to product design and manufacturing. It can be estimated based on the life accelerated tests. So when the product is in pre-production phase, the product life accelerated tests must be applied to ensure the required MTBF value is achievable.

9.3 Acceptance Quality Level

The MIL-STD-105E shall be used as the standard of making the random sampling inspections for product manufacturing. The minimum Acceptance Quality Level for this product is defined as following:

Critical defects: no critical defect is acceptable

Major defects: AQL

Minor defects: AQL

The author should define the AQL value based on the product characteristics.

Defects Classification:

Critical: likely to result in unsafe condition or contravene mandatory regulation (no critical defect is accepted).

Major: reduces the usability of the product or is an obvious appearance defect.

Minor: doesn't reduce the usability of the product, but is a defect beyond the defined quality standard.

The author can define these three types of defects in more detailed if it is necessary.

10.0 Approval

After this document has been reviewed by all related manager and engineers listed below, and the document has been refined based on review comments, this document should be signed and approved by all required approvers.

	Department Approval required if checked	Name	Signature	Approved	Rejected*	Date
<input type="checkbox"/>	Project Manager			<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	Product Manager			<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	Operation Manager			<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	Product Development			<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	Senior Design Engineer			<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	Quality Assurance			<input type="checkbox"/>	<input type="checkbox"/>	

* If someone rejected the approval, please describe the reason here.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.