

Customer :
ALPS ELECTRIC EUROPA GmbH

No.D060027 (1/19)

Date : Apr. 11. 2006

Attention :

Your ref. No.:

Your Part No.: TDQB3-002A

SPECIFICATIONS

ALPS
MODEL : TDQB3-002A

Spec. No. :

Sample No. :

RECEIPT STATUS

RECEIVED

By. Date

Signature

Name

Title

ALPS[®]
ALPS ELECTRIC CO., LTD.

HEAD OFFICE

1-7, YUKIGAYA OTSUKA-CHO, OHTA-KU, TOKYO.

145-8501 JAPAN

PHONE : (3) 3726-1211

FAX : (3) 3728-1741

COMMUNICATION DEVICES DIVISION

1-2-1, OKINOCHI, SOMA-CITY, FUKUSHIMA-PREF.

976-8501 JAPAN

PHONE : (244) 36-5111

FAX : (244) 36-1902

DSG'D

S. Matsushita

APP'D

[Signature]

Sales

ALPS PRODUCT SPECIFICATION
SPECIFICATION
DIGITAL FRONT-END MODULE

MODEL NUMBER: TDQB3-002A

- With DC/DC With Loop Through
- Without DC/DC Without Loop Through

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TDQB3-002A	TDQB3-002A
CUST. MODEL NO.	ALPS MODEL NO.

					DSGD.				
					<i>S. Matsumoto</i>				
					CHKD.	TITLE	TDQB3-002A	PRODUCT SPECIFICATION	
					APPD.		Version1.0	(1 / 16)	
					<i>Apr. 11. 01 S.H.</i>				
SYMB.	DATE OR NO.	APPD.	CHKD.	DSGD.	ALPS ELECTRIC CO., LTD.				

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1. TECHNICAL SPECIFICATION

ITEM No.	ITEM	Condition												
1-1	Input • Input Frequency Range • Channel Bandwidth • Channel Assignment • Input Signal Level • Input Impedance • Modulation Modes	UHF : 470MHz to 862MHz 8MHz CCIR -80dBm to -20dBm (typical) 75 ohms nominal DVB-T												
1-2	Output • Output Format • Output Frequency	Digital ch. : Balance IF output Center : 36.166MHz												
1-3	Control format	IIC Compatible Interface Refer to the Appendix. The reference frequency step of the Tuner section PLL is 166.666kHz Xtal: 4MHz, Reference divider: 24, IF center frequency: 36.166MHz												
1-4	Power Supply Voltages (ripple : 5mVp-p)	<table border="0"> <tr> <td>Pin Number</td> <td>Operating Supply Voltages</td> </tr> <tr> <td>2 / B1 (+5V)</td> <td>+5.0V±0.25V DC</td> </tr> <tr> <td>18 / IF AGC (+3.3V)</td> <td>+0V to +3.3V DC</td> </tr> </table>	Pin Number	Operating Supply Voltages	2 / B1 (+5V)	+5.0V±0.25V DC	18 / IF AGC (+3.3V)	+0V to +3.3V DC						
Pin Number	Operating Supply Voltages													
2 / B1 (+5V)	+5.0V±0.25V DC													
18 / IF AGC (+3.3V)	+0V to +3.3V DC													
1-5	Current Consumption													
	Operation Mode	<table border="0"> <tr> <td>Pin Number</td> <td>Typ.</td> <td>Max.</td> </tr> <tr> <td>2 / B1 (+5V)</td> <td>180 mA</td> <td>210 mA</td> </tr> <tr> <td>11 / Tuning (+32V)</td> <td>1 mA</td> <td>1.5 mA (without DCDC)^{*NOTE}</td> </tr> <tr> <td>18 / IF AGC (+3.3V)</td> <td>—</td> <td>1mA</td> </tr> </table>	Pin Number	Typ.	Max.	2 / B1 (+5V)	180 mA	210 mA	11 / Tuning (+32V)	1 mA	1.5 mA (without DCDC) ^{*NOTE}	18 / IF AGC (+3.3V)	—	1mA
Pin Number	Typ.	Max.												
2 / B1 (+5V)	180 mA	210 mA												
11 / Tuning (+32V)	1 mA	1.5 mA (without DCDC) ^{*NOTE}												
18 / IF AGC (+3.3V)	—	1mA												
	Power save mode	<table border="0"> <tr> <td>2 / B1 (+5V)</td> <td>70 mA</td> <td>90 mA</td> </tr> <tr> <td>11 / Tuning (-32V)</td> <td>0 mA</td> <td>0 mA (without DCDC)^{*NOTE}</td> </tr> <tr> <td>18 / IF AGC (+3.3V)</td> <td>—</td> <td>1mA</td> </tr> </table>	2 / B1 (+5V)	70 mA	90 mA	11 / Tuning (-32V)	0 mA	0 mA (without DCDC) ^{*NOTE}	18 / IF AGC (+3.3V)	—	1mA			
2 / B1 (+5V)	70 mA	90 mA												
11 / Tuning (-32V)	0 mA	0 mA (without DCDC) ^{*NOTE}												
18 / IF AGC (+3.3V)	—	1mA												
1-6	Environmental Specifications													
1-6-1	Temperature	Operating 0 to +60°C Storage -10 to +70°C												
1-6-2	Humidity	Operating Less than 80 % RH(at40°C) Storage Less than 95 % RH(at40°C)												

*NOTE : Models with DCDC do not need TU voltage. Leave it open.

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2. Standard Test Conditions

Test for electrical specification shall be performed on ALPS evaluation board,
at following condition unless otherwise specified.

ITEM No.	ITEM	CONDITION	
2-1	Ambient Conditions	Temperature	25±2 deg C
		Humidity	65±5% RH
2-2	Power Supply	Pin Number	Operating Supply Voltages
		2 / B1 (+5V)	+5.0V ±0.1V DC
		11 / Tuning (+32V)	+32.0V ± 1V DC (without DCDC)*NOTE
		18 / IF AGC (+3.3V)	+0V to +3.3V DC

*NOTE : Models with DCDC do not need TU voltage. Leave it open.

3. Absolute Maximum Voltage

ITEM No.	ITEM	CONDITION	
3	Absolute Maximum Voltage	Pin Number	Maximum Voltages
		1 / B1 (+5V)	+5.5V DC
		11 / Tuning (+32V)	+34V DC (without DCDC)*NOTE
		18 / IF AGC (+3.3V)	+0V to +3.3V DC

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4. Electrical Specifications

ITEM	SPECIFICATION				CONDITION
	MIN.	TYP.	MAX.	UNIT	
4-1 RF Input Specification					
4-1-1 ANT Input Return Loss		8		dB	47 to 862MHz
4-1-2 L/T Output Return Loss		12		dB	47 to 862MHz
4-1-3 L/T Gain	-2	2	4	dB	47 to 862MHz Power Supply ON (Pin2)
4-1-4 L/T Noise Figure		6		dB	47 to 862MHz Power Supply ON (Pin2)
4-1-5 Spurious Signal at ANT Input			46 54	dBuV dBuV	Other terminal should be Termination (75ohms) 30 - 950MHz 950 - 1750MHz
4-1-6 L/T 3rd Order Inter modulation	55	70		dB	2f1-f2 f1 : 50-850MHz f2 : f1+10MHz

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4. Electrical Specifications

ITEM	SPECIFICATION				CONDITION
	MIN.	TYP.	MAX.	UNIT	
4-2 Tuner Specification					
4-2-1 Noise Figure		6		dB	Full Gain 470MHz to 862MHz
4-2-2 Image rejection		60 55		dB	Full Gain 470MHz to 790MHz 791MHz to 862MHz
4-2-3 AGC1 control range		60		dB	
4-2-4 AGC1 start point		-50		dBm	AGC1 start point is -47dBm RF input level(RF=858MHz). AGST = (100)
4-2-5 1 st Local Oscillation(LO)	-50 -50		50 50	ppm ppm	@Initial frequency accuracy (standard temperature:25°C) @Temperature drift(-10°C to +60 °C :This value is against the initial value)
4-2-6 1 st LO phase noise		-70 -85		dBc/Hz dBc/Hz	1KHz offset 10KHz offset
4-2-7 1 st reference side band		-60		dBc	
4-2-8 1 st LO Lock-up time			50	ms	Lock to f0 ± 30KHz
4-2-9 X-tal output level		1.0		Vp-p	

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						Version1.0	(7/16)		
						ALPS ELECTRIC CO., LTD.			
SYMB.	DATE OR NO.	APPD.	CHKD.	DSGD.					

4. Electrical Specifications

ITEM	SPECIFICATION				CONDITION
	MIN.	TYP.	MAX.	UNIT	
4-3 IF AMP Specification					
4-3-1 IF AGC control range		60		dB	
4-3-2 IF Output level		0		dBm	Unbalance 1kΩ load. The condition is as follows RF Input level : -90dBm IF AGC Voltage : 3.3V Input RF frequency : 858MHz

NOTE : Case of unbalance output : other terminal should be termination(2KΩ).

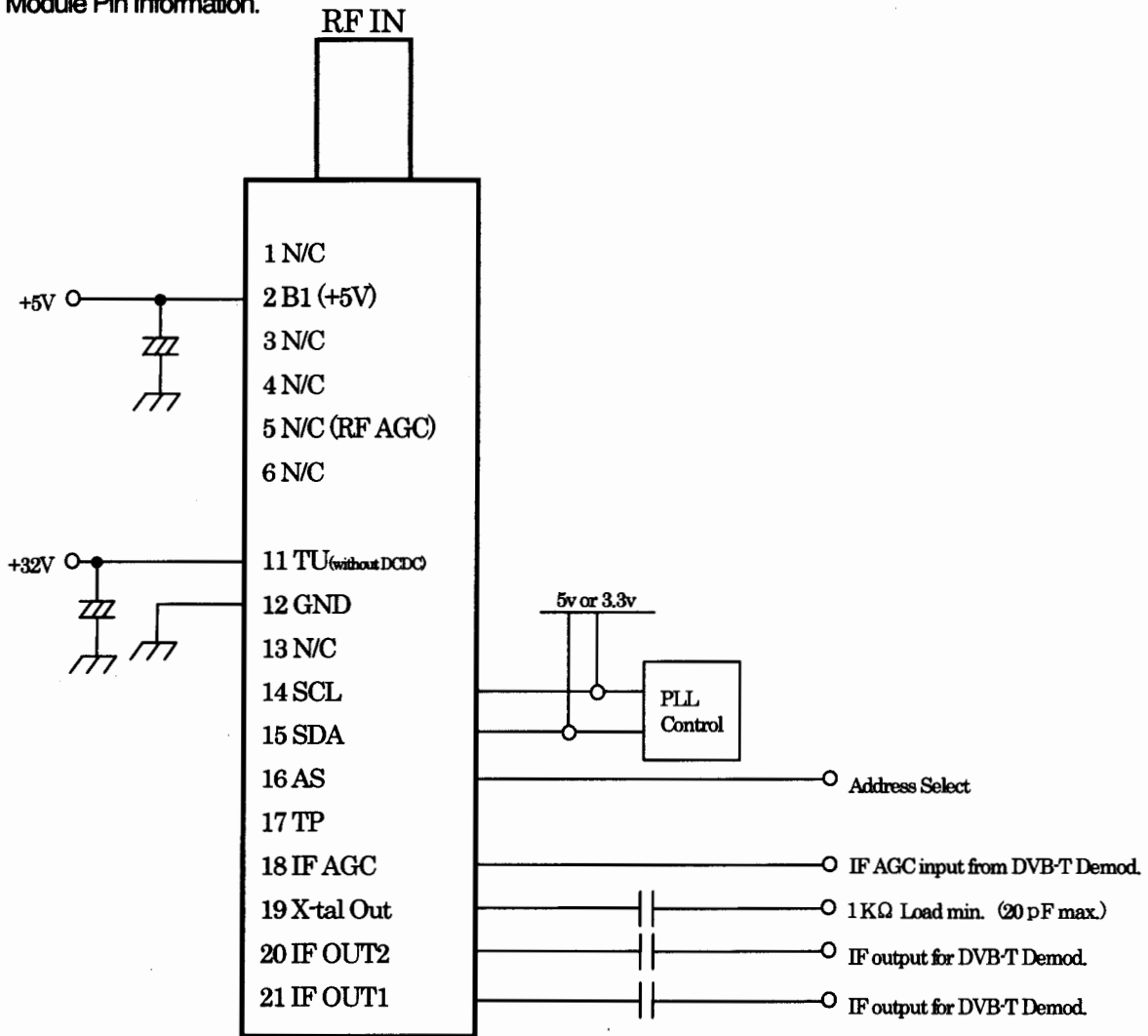
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5. Mechanical Information

5-1. Module Pin Information.



1	No connection (Leave this terminal open)	13	No connection (Leave this terminal open)
2	+5.00V +/- 0.25V for LNA and Tuner	14	I2C clock
3	No connection (Leave this terminal open)	15	I2C data
4	No connection (Leave this terminal open)	16	I2C address select terminal
5	0 to 4V for RF AGC (Leave this terminal open)	17	Test Pin (Leave this terminal open)
6	No connection (Leave this terminal open)	18	0V to 3.3V for IF AGC
		19	NC or X-tal Output
11	+32V for tuning (without DCDC)*NOTE	20	Digital IF signal output 2
12	GND	21	Digital IF signal output 1

*NOTE : Models with DCDC do not need TU voltage. Leave it open.

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								Version1.0	(9 / 16)
						ALPS ELECTRIC CO., LTD.			
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ITEM No	ITEM	Specification
5-2	Appearance Structure	Dimensions as mechanical drawing
5-3	RF Input Connector Form	IEC Female Connector
5-4	Weight	31g Typ.

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								TITLE	PRODUCT
								TDQB3-002A	SPECIFICATION
								Version1.0	(10/16)
								ALPS ELECTRIC CO., LTD.	
SYMB.	DATE OR NO.	APPD.	CHKD.	DSGD.					

6. ENVIRONMENTAL TESTS

ITEM	CONDITION
6-1 TESTING CONDITIONS	
6-1-1 Heat load test	Measure initial value at standard testing conditions. Leave samples in 70±2 °C for 96±5 hours, and in standard testing conditions for 2 hours, then take measurements within 1 hour. Supply voltage cycle : 1.5 h ON / 0.5 h OFF
6-1-2 Humidity load test	Leave samples in 40±5 °C for 24±2 hours, and in standard testing conditions for 2 hours, then take measurements. Leave samples in 40±2 °C, 90 ~ 95 % RH, for 96±5 hours, and in standard testing conditions for 2 hours, then take measurements within 1 hour. Supply voltage cycle : 1.5 h ON / 0.5 h OFF
6-1-3 High Temperature Operating Life Test	To be test after loading samples for 96±8 hours at 50±2°C and with 1 hour in room temperature / no load. Supply voltage : Standard
6-1-4 Cold test	Measure initial value at standard testing conditions. Leave samples in -20±2 °C for 96±5 hours, and in standard testing conditions for 2 hours, then take measurements within 1 hour.
6-1-5 High Voltage Test ESD	ANT Input 1000pF, 150Ω, ±15kV, 10times Terminal 200pF, 0Ω, ±200V, 5times
6-1-6 Vibration Test	Vibration test fixture is used to vibrate the tuner with a total amplitude of 1mm and frequency ranging from 10 to 55Hz, once per minutes consecutively, for 40 minutes in each of three directions, X, Y and Z.
6-1-7 Impact Test	Impact acceleration : 50 m/s ² Impact time : 11ms Impact time & direction : 3 times per each 6 sides
6-1-8 Packing Box Fall Test	Fall height : 40 cm Process : Drop directly to concrete floor. Concrete floor must be 20cm or thicker. Turn of the fall : 1 corner and 2 ridge, 5 face (except the top face) / each 1 time (total 8 times)
6-2 SPECIFICATION	Conversion Gain: ±3 dB Noise Figure: ±3 dB Output Level : ±4dB * Except for Vibration test, Impact test, Packing Box Fall test, High Voltage test, ESD.

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						TDQB3-002A	SPECIFICATION		
						Version1.0	(11 / 16)		
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7. MECHANICAL SPECIFICATION												
ITEM No.	ITEM	Condition										
7-1	Outline view Assembly Appearance	No defects of wiring, soldering and assembling. No dirt, corrosion or foreign material.										
7-2	Appearance Structure Dimension Mounting Weight	As assembly drawing. As assembly drawing. Approximately 31±5 [g]										
7-3	ANT connector strength (Type F connector)	No function fault, no remove or no crack or on falling of Type F connector and no crack of PWB, when add force of 0.98 [Nm] to the connector point.										
7-4	Heatproof (Pb Free Solder)	<p>The tuner shall be tested resistance to soldering heat in following conditions.</p> <ol style="list-style-type: none"> Shall be satisfied with Electrical and mechanical specifications Good appearance after testing. <table border="1" style="margin-left: 40px;"> <thead> <tr> <th></th> <th>Temp. [°C]</th> <th>Time [sec]</th> </tr> </thead> <tbody> <tr> <td>(1) Flow soldering</td> <td>260 ± 5</td> <td>10 + 1 / - 0</td> </tr> <tr> <td>(2) Iron soldering</td> <td>400 ± 5</td> <td>3 + 1 / - 0</td> </tr> </tbody> </table> <p>• After the tuner is heated, it leaves at the normal temperature for 1 hour. The board thickness for test is 1.6mm.</p>			Temp. [°C]	Time [sec]	(1) Flow soldering	260 ± 5	10 + 1 / - 0	(2) Iron soldering	400 ± 5	3 + 1 / - 0
	Temp. [°C]	Time [sec]										
(1) Flow soldering	260 ± 5	10 + 1 / - 0										
(2) Iron soldering	400 ± 5	3 + 1 / - 0										
7-5	Solder ability (Pb-free Solder)	<p>Solder-ability is measured by Meniscus solder test in following conditions after heat treatment and PCT.</p> <ol style="list-style-type: none"> Solder-ability must be in 5[sec]. Solder area must be 95% or more of dip area. <p>Test conditions</p> <ol style="list-style-type: none"> Solder temperature : 240±5 [°C] PCT conditions : 105 [°C], 100%RH, 1.22 × 10⁵ [Pa], 4 hour. Solder : Sn/3.0Ag/0.5Cu (Weight %) M705 made of SMIC. <p>Flux : ROSIN 25%/IPA 75% EC-19S-8 made of TAMURA</p>										

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						Version 1.0	(12 / 16)		
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2. Read mode

	MSB				LSB						Hex.
ADDRESS	1	1	0	0	0	0	1	1	A	Byte1	C3
Status byte	POR	FL	1	1	1	A2	A1	A0	A		

Description of data symbol

SYMBOL	DESCRIPTION	DEFAULT
POR	power-on reset flag POR set : Power-on POR reset : End-of-data at transmission procedure	POR=1
FL	In-lock flag PLL lock (FL=1) Unlock (FL=0)	
A2...A0	ADC data (See ADC convert level)	

ADC convert level

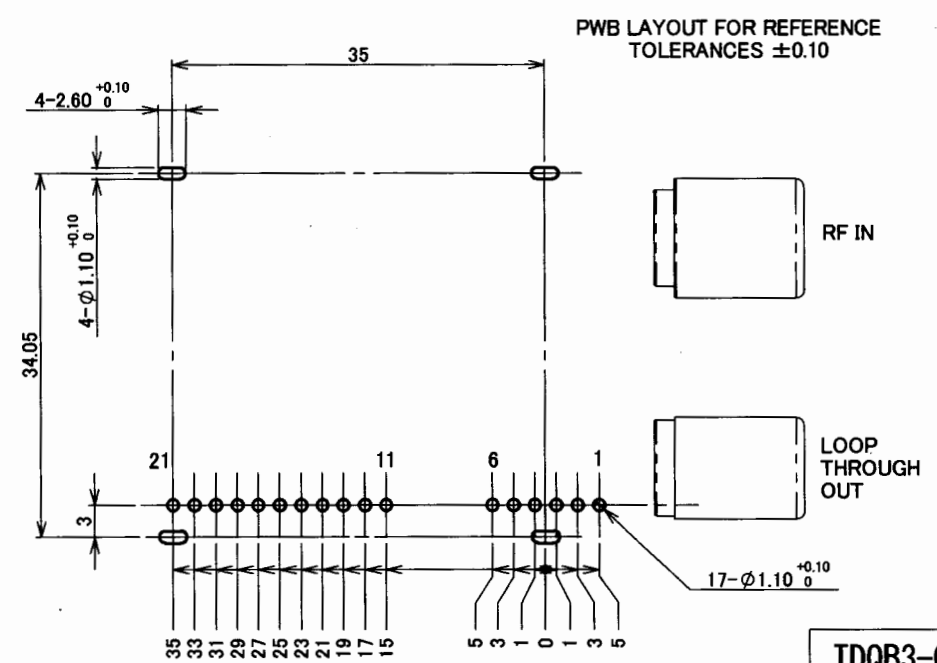
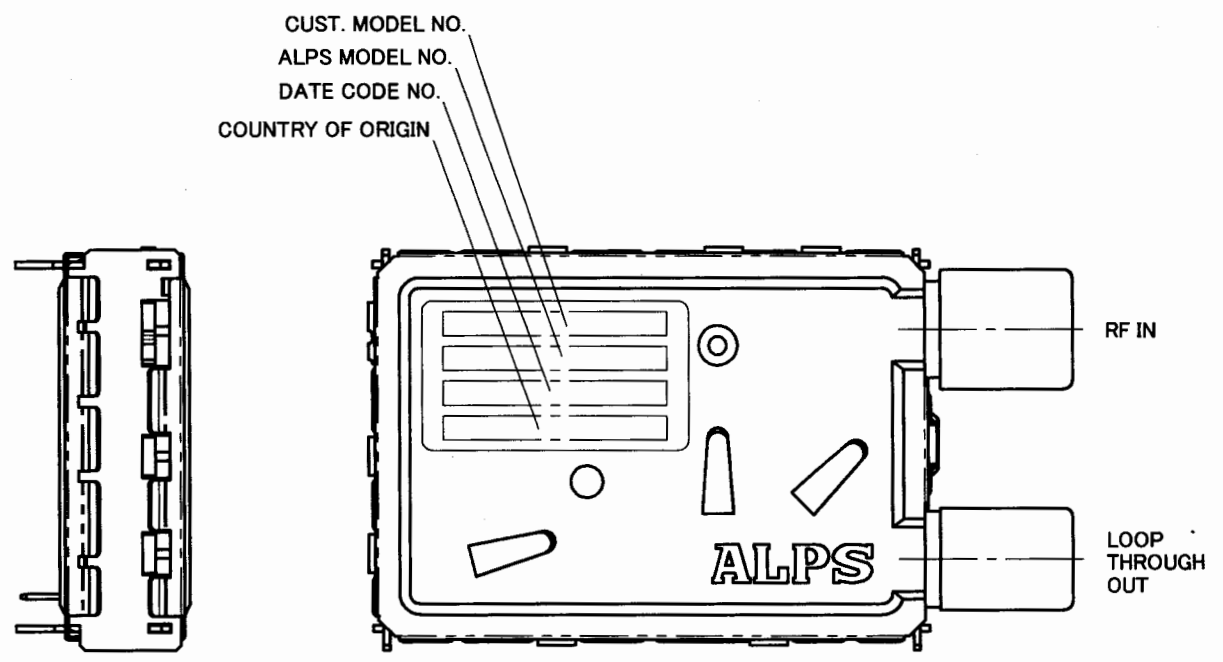
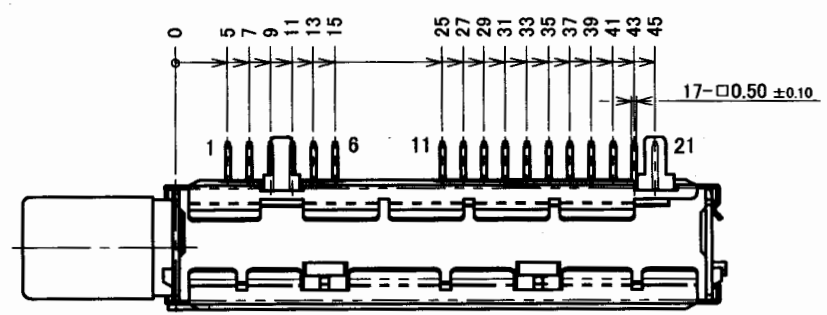
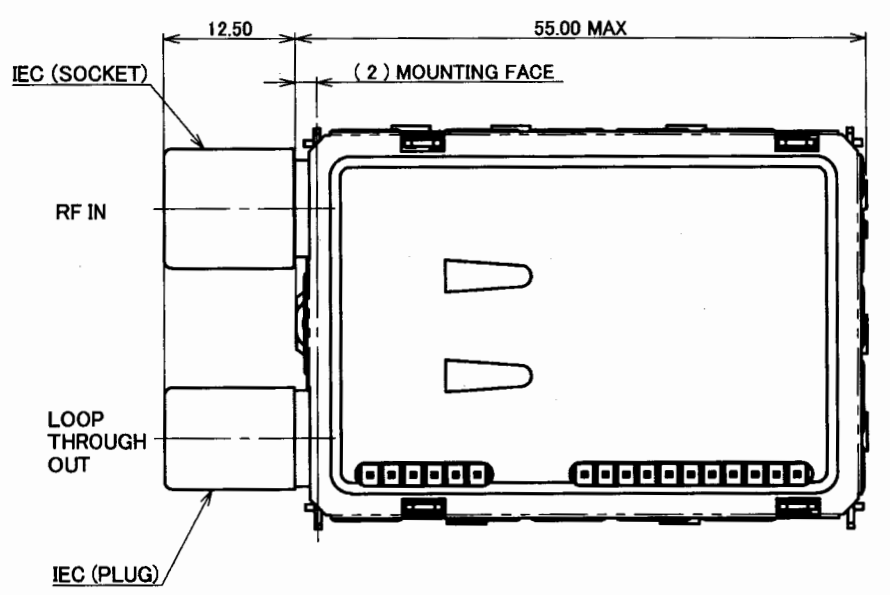
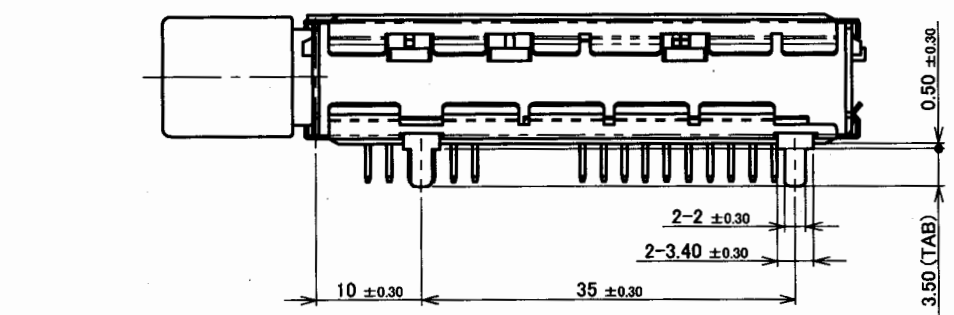
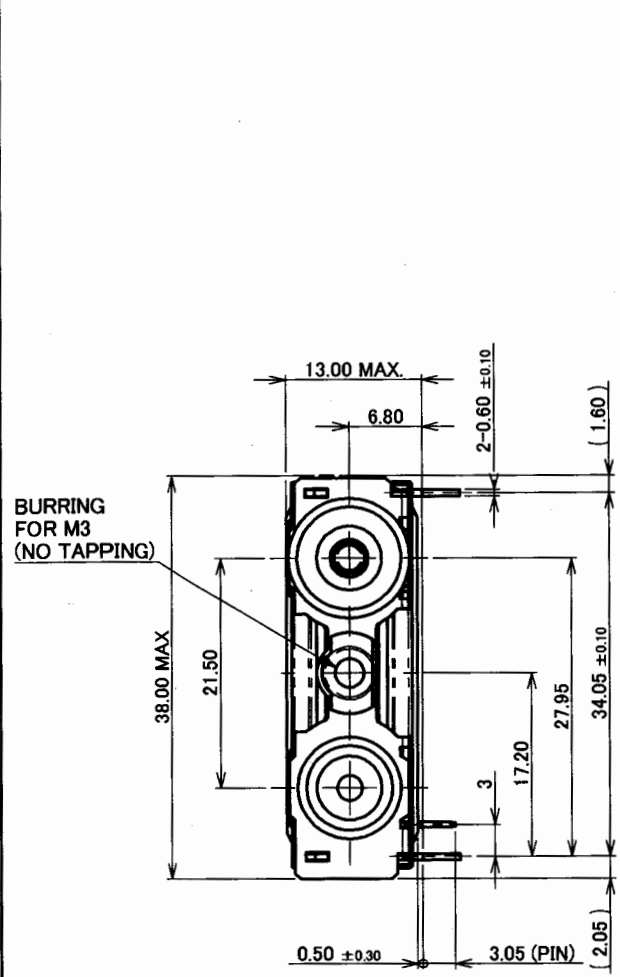
Voltage applied on ADC input	A2	A1	A0
0.6Vcc to Vcc	1	0	0
0.45Vcc to 0.6Vcc	0	1	1
0.3Vcc to 0.45Vcc	0	1	0
0.15Vcc to 0.3Vcc	0	0	1
0 to 0.15Vcc	0	0	0

*Vcc=B1(+5V)

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- NOTES
1. TOLERANCES ARE ±0.5mm, UNLESS OTHERWISE SPECIFIED.
 2. DIMENSION OF TERMINALS IS SPECIFIED AT THE ROOT.
 3. ALPS CAN ALTER FRAME AND COVER DESIGN WITHOUT NOTICE IF NO ELECTRICAL DEGRADATION.
 4. THE PRINTING ID IS ON LABEL.
 5. DATE CODE NO. IS CONFORMED TO ALPS STANDARD SPECIFICATION.
 6. MATERIALS
FRAME : TINPLATE
PIN : BRASS (Ni PLATING 1 μ MIN. Sn PLATING 2 μ MIN.)

TDQB3-002A	TDQB3-002A
CUST. MODEL NO.	ALPS MODEL NO.

PART NO.	NAME	MATERIAL	SPEC.	FINISH
ALPS ELECTRIC CO., LTD.				
DSGD <i>Apr. 11. 06 T. Saito</i>		SCALE 2:1	TITLE TDQ ASSEMBLY DRAWING	
CHKD.		UNIT mm	APPD. <i>Apr. 11. 06 S. M. [Signature]</i>	
ZONE	SYMB.	DATE OR NO.	APPD.	CHKD.
			DSGD.	

RECORD OF REVISION**TDQB3-002A**

DATE	PRESENT CONTENTS	NEW CONTENTS / REASON		DSGN BY
Apr. 11 '06 (D060027)	NEW			S.MATSUSHITA
		CZECH	ALPS ELECTRIC CZECH,S.R.O.	
		KOREA	ALPS ELECTRIC KOREA CO.,LTD.	
		MALAYSIA	ALPS ELECTRIC (MALAYSIA) SDN.BHD	
		SHANGHAI	SHANGHAI ALPS ELECTRONICS CO.,LTD.	
		JAPAN	ALPS ELECTRIC CO.,LTD.	
		M A N U F A C T U R E R		