

SPECIFICATION



LG Innotek Co., Ltd.

Approved	Checked	Designed	Model No.	TMVA-L102F
<i>J, w</i> <i>Kim</i> Dec 21, 2006	<i>J, s</i> <i>Moon</i> Dec 21, 2006	<i>s, h</i> <i>Song</i> Dec 21, 2006	Document No.	XC40002

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1. Features

- Receives digital, analog air and cable signals
- NTSC, ATSC(8 VSB), QAM, Modulator(3.4Ch) complaint
- Digital Outputs
 - Analog video(CVBS) & audio(IIS, SPDIF)
- Analog Outputs
 - Demodulator with output CVBS, SIF
- power supply : 5.0V, 3.3V, 2.5V, 1.25V
- Video decoder: MPEG2 [MP@HL](#)
- Audio decoder:
 - Dolby AC3.2 channels
 - MPEG Audio
- Relative Low power consumption

2. Ordering information

Type	Description
TMVA - L102F	F-connector socket (TV ANT/TV OUT)

3. Label marking

XXXXXXXXXX	Maker name
TMVA - L102F	Model name
XXXXXXXXXX	Code number (year/month/lot/date/production line)

4. General specification

4-1. Supporting system

: ATSC, NTSC, QAM, MD compliant

4-2. Receiving frequency

: 54 ~ 806 M Hz

4-3. 1'st IF center frequency

: 1220 MHz

4-4. 2'nd IF center frequency

: 44.00 MHz

4-5. Output channel of modulator

: US 3 / 4 Ch

4-5. Input signal level

: - 79dBm ~ - 10dBm

4-6. Input/ Output condition

- ANT Input impedance : 75Ω unbalance
- ANT Output impedance: 75Ω unbalance
- Video output load : 75Ω
- Audio output load : 600Ω

4-7. Communication Speed

4-8. Others

- Channel selection : MOPLL synthesizer, MT2131(Microtune)
- Decoder : LGDT1111A(LG Electronic)
- Analog demodulator: TDA9881(Philips)
- Modulator:TA1372F(Toshiba)

5. Operating test conditions

5-1. Voltage

- B1 : + 5V ($\pm 0.25V$)
- B2 : + 3.3V ($\pm 0.165V$)
- B3 : +2.5V($\pm 0.125V$)
- B4 : +1.25V($\pm 0.0625V$)

5-2. Operating temperature: -10 ~ +60

5-3. Operating humidity: Less than 65%RH (at 40)

6. Storage test conditions

6-1. Storage temperature: -10 ~ +70

6-2. Storage humidity: Less than 70%RH (at 40)

7. Standard test conditions

The Test for electrical specification shall be performed under the following condition
Unless otherwise specified.

7-1. Ambient condition

Temperature	25 ± 2
Humidity	65 ± 2%RH

7-2. Power supply voltages

Terminal	Supply voltage	Ripple
+5.0V	+5.0V ± 0.25V	Max 20mVp-p
+3.3V	+3.3V ± 0.165V	
+2.5V	+3.3V ± 0.125V	
+1.25V	+1.25±0.0625	
SDA, SCL	Specified tuning pulse	

7-3. Current consumptions

Terminal	Min.	Typ.	Max.	Unit
B1(+5.0V)	486	540	594	mA
B2(+3.3V)	945	1050	1155	mA
B3(+2.5)	252	280	308	mA
B4(+1.25V)	585	650	715	mA

8. Electrical characteristics.

8-1. Loop-through section characteristics

Unless otherwise specified, measurement range shall be 54MHz ~ 806MHz,
and unused RF terminals shall be terminated by rated impedance Terminator.

Item	Specification				Conditions
	Min.	Typ.	Max.	Unit	
Insertion loss	-	6	9	dB	ANT in to ANT out Mode : TV(at MD off)
VSWR	-	5	6		ANT in /out terminal Mode : TV (at MD off) 54MHz ~ 810MHz
Isolation	60	65	-	dB	Isolation from ANT out to ANT in Mode:VCR(at MD on) 61MHz ~ 72MHz
ANT leakage	-	-	9.5	dBuV	Mode: VCR(at MD on) RF-modulator section : none input signal
	-	-	46		Mode: VCR(at MD on) Tuner OSC leakage. (54 to <1000MHz)
	-	-	52		Mode: VCR(at MD on) Tuner OSC leakage. (1000 to <1800MHz)

8-2. RF-Modulator section characteristics

Item	Specification				Conditions
	Min.	Typ.	Max.	Unit	
Video carrier output level	63	66	69	dB μ V	Video input signal : 1Vp-p 100% white signal.
Video modulation	74	80	86	%	Input signal : 1.0Vp-p white Measure at the output of the standard demodulator.
Video carrier frequency	-150	-	+150	kHz	Video input signal : none
Video amplitude frequency characteristics	-3.0	-0.5	+3.0	dB	Measure range : 0.1MHz ~ 4.2MHz Based on 1MHz
Differential Gain (DG)	-	2	7	%	Input signal : FCC Composite Chrominance : 20 IRE Luminance : 0 ~ 90 %
Differential Phase (DP)	-	2	7	deg	
Video S/N	45	47	-	dB	Input signals video : 100% white signal audio : none Video band : 0.1MHz ~ 4.2MHz HPF : 100kHz, LPF : 4.2MHz SC Trap : on, WEIGHT : on
Chroma beat (920kHz P.C.S.beat)	55	65	-	dB	Input signal : 0.4Vp-p 3.58MHz sine wave Use spectrum analyzer to measure the level of fp + 0.92MHz The value is relative to the level of Fp without video modulation.
Sound carrier frequency	4493	4500	4507	kHz	Audio input signal : none The measurements are taken after 1 min. from the power on.
P/S ratio (sound carrier level)	-12	-14	-17	dB	Audio input signal : none Other conditions : same as item Video carrier output level

Audio modulation (deviation)	32 (64)	40 (80)	48 (96)	kHz /dev (%)	Input signal : 1.04Vp-p 1kHz sine wave (100 % modulation = ± 25kHz dev.)
Audio amplitude frequency characteristics	-3	-	+3	dB	Input signal : 1.04Vp-p Measure range : 100Hz ~ 10kHz Based on 1kHz
Audio distortion	-	0.5	2.0	%	Input signals : audio : 1.04Vp-p, 1kHz sine wave video : 1Vp-p color bar De-emphasis is on.(75μs)
Audio S/N	45	48	-	dB	Input signals : audio : 1.04Vp-p, 1kHz sine wave video : All black(sync. only) Use standard demodulator of inter-carrier system. De-emphasis is on.(75μs)
Out-band spurious	39.5	-	-	dB	Video input signal : 1Vp-p color bar Measure range : 0 ~ 1GHz Except the range from fp-4.6MHz to fp+7.4MHz.
In-band spurious	60	-	-	dB	Input signals : video, audio : none Measure range : fp~fp+4.5MHz.
Terminal leakage	-	-	54	dBμV	Measure range : 0 ~ 1GHz except GND.

8-3. NTSC demodulation section characteristics

When the test electrical characteristics when there are no instruction. fp input level is 70 dB μ V and p/s ratio is -7 dB and sync ratio is 30%.

Item		Specification				Conditions
		Min.	Typ.	Max.	Unit	
IF rejection		-13	-	-	dB	
Image rejection		-13	-	-	dB	
Video S/N		45	48	-	dB	50% white signal. 87.5% modulation. Sub-carrier trap : on HPF : 100 kHz, LPF : 4.2 MHz
Noise limiting sensitivity		-	45	50	dB μ V	50% white signal. 87.5% modulation. Sub-carrier trap : on HPF : 100kHz, LPF : 4.2MHz Video S/N=30dB
Video output level		0.8	1.0	1.2	Vp-p	Standard color bar:87.5% mod.
SYNC ratio		28	30	32	%	Standard color bar:87.5% mod.
Video ampli- tude frequency characteristics	1.0MHz	-3	-1	+2	dB	Multi-burst : 87.5% mod. Based on 0.5 MHz
	2.0MHz	-3	-1	+2		
	3.0MHz	-4	-2	+2		
	3.58MHz	-6	-3	+2		
Sin ² 2T pulse response		70	90	-	%	Sin ² 2T pulse & bar : 87.5% mod.
Differential Gain		-	5	10	%	5 stair-steps : 87.5% mod. Set modulation at the peak of 5'th chroma signal
Differential Phase		-	5	10	deg	
Y/C delay time [US 13 CH.]		-150	-	+150	nSec	Sin ² 2T pulse & bar:87.5% mod.
SIF Output Level		80	90	-	dB μ V	Sound un-modulated. Measured at 4.5MHz with Spectrum Analyzer

8-4. ATSC demodulation section characteristics

Item		Specification				Conditions
		Min.	Typ.	Max.	Unit	
Phase Noise(@ 100kHz)		92	-	-	dBc /Hz	
Input sensitivity		-	-82	- 78	dBm	for Threshold Visibility
Maximum input level		-8	0	-	dBm	for Threshold Visibility
CVBS output level		0.8	0.2	1.2	Vp-p	for Threshold Visibility
AWGN(Additive White Gaussian Noise)		-	15.5	-	dB	for Threshold Visibility
Equalizer range		-45	-	50	Usec	Static profile
DTV co-channel D/U ratio		-	15.5	-	dB	D/U level at the antenna Desired : -53dBm
NTSC co-channel D/U ratio		-	2.5	-	dB	D/U level at the antenna Desired : -53dBm
DTV adjacent channel D/U ratio	Level	-68	-53	-28	dBm	D/U level at the antenna
	N ± 1	33	33	20	dB	
	N ± 2	44	40	20		
NTSC adjacent channel D/U ratio	Level	-68	-53	-28	dBm	D/U level at the antenna
	N ± 1	40	35	26	dB	
	N ± 2	44	40	20		

8-5. QAM demodulation section characteristics

Item		Specification				Conditions
		Min.	Typ.	Max.	Unit	
Input level	64QAM	-20	-	+20	dBmV	for Threshold Visibility
	256QAM	-15	-	+20	dBmV	for Threshold Visibility
CVBS output level		0.8	1.0	1.2	Vp-p	for Threshold Visibility

9. PLL descriptions

9-1. Tuner section registers

9-1-1. Address field

	MSB (Bit7)	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	LSB (Bit0)
Address Byte	1	1	0	0	0	SERa1	SERa0	R/W

9-1-2. Serial Communications register map

	Register Address	MSB (Bit7)	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	LSB (Bit0)	Def
Part /Rev	00	PART/REV								0×3D
LO1C1	01	NUM1(12-5)								0×50
LO1C2	02	0	0	0	NUM1(4-0)				0×00	
LO1C3	03	DIV1								0×50
LO2C1	04	NUM2(12-5)								0×80
LO2C2	05	0	0	0	NUM(4-0)				0×00	
LO2C3	06	0	DIV2						0×49	
PWR	07	RFAG -Cen	UPC -en	DNC -en	VGA -en	FDC -en	AFC -en	SRO -en	GPO	0×F2
LO Status	08	LO1 LK	LO1AD			LO2 LK	LO2AD			XX
AFC Status	09	AGC done	VGA GOK	PD1			PD2			XX
TEMP	0A	XLOW	AFCAD			TEMP				XX
UPC 1	0B	0	LNAGain		Band					0×61
UPC 2	0C	UPCIbuf		UPCImix		UPCILNA		gcATTN(1-0)		0×04
AGC 1	0D	gcATTN(9-2)								0×00
AGC 2	0E	0	gcRL							0×00

	Register Address	MSB (Bit7)	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	LSB (Bit0)	Def
AGC 3	0F	gcDNC								0×00
AGC 4	10	AGC Cfrz	gcRLmax							0×7F
AGC 5	11	gcDNCmax								0×00
AGC 6	12	PD1lev			0	1	0	1	0	0×8A
AGC 7	13	PD2lev			1	1	1	0	0	0×9C
Misc Cntl 1	14	0	VGA Hi Gain	VGAI		DNCILO		DNCIbuf		0×00
Misc Cntl 2	15	0	AGC RST	0	0	1	0	XDIVE		0×0C
LO Cntl	16	LO1 en	0	1	0	LO2 en	0	1	0	0×AA
Reserved	17	0	1	1	1	1	0	0	0	0×78
Reserved	18	1	0	0	0	0	0	0	0	0×80
Reserved	19	1	1	1	1	1	1	1	1	0×FF
Reserved	1A	0	1	1	0	1	0	0	0	0×68
Reserved	1B	1	0	1	0	0	0	0	0	0×A0
Reserved	1C	1	1	1	1	1	1	1	1	0×FF
Reserved	1D	1	1	0	1	1	1	0	1	0×DD
Reserved	1E	0	0	0	0	0	0	0	0	0×00
Test 2b	1F	CapTrim								0×00

9-1-3. register descriptions

Field	Register	R/W	Bits	Default	Descriptions
PART/REV	Part/Rev	R	8	0×00	Part/Rev Code
NUM1	LO1C 1,2	R/W	13	0×05 00	0×7FLO1 FracN Numerator
DIV1	LO1C 3	R/W	8	0×50	LO1 Divider $f_{LO1} = f_{SRO} \times [DIV1 + NUM1 \div (8191 + LO1Dmax)]$
NUM2	LO2C 1,2	R/W	13	0×80 00	LO2 FracN Numerator
DIV2	LO2C 3	R/W	7	0×49	LO2 Divider $f_{LO2} = f_{SRO} \times [DIV2 + NUM2 \div (8191 + LO2Dmax)]$
RFAGCen	PWR	R/W	1	0×01	Enable automatic RF AGC
UPCen	PWR	R/W	1	0×01	Enable UP-converter / LO1
DNCen	PWR	R/W	1	0×01	Enable Down-converter / FGA / LO2
VGAen	PWR	R/W	1	0×01	Enable Variable Gain Amplifier
FDCen	PWR	R/W	1	0×00	Enable Forward Data Channel Amplifier
AFCen	PWR	R/W	1	0×00	Enable AFC A/D
SROen	PWR	R/W	1	0×01	Enable SRO
GPO	PWR	R/W	1	0×00	General-purpose Input / Output
LO1LK	LO Status	R	1	-	LO1 PLL Lock Status (0=Unlock, 1=Locked)
LO1AD	LO Status	R	3	-	LO1 VCO Voltage 0 : $V_{cmtank} - 0.9 < V_{tune} < V_{cmtank} - 0.1$ 2: $V_{cmtank} - 1.1 < V_{tune} < V_{cmtank} - 0.9$ 3: $V_{tune} < V_{cmtank} - 1.1$ 4: $V_{cmtank} - 0.1 < V_{tune} < V_{cmtank}$ 5: $V_{tune} > V_{cmtank}$

Field	Register	R/W	Bits	Default	Descriptions
LO2LK	LO Status	R	1	-	LO2 PLL Lock Status (0=Unlock, 1=Locked)
LO2AD	LO Status	R	3	-	LO2 VCO Voltage: 0 : $V_{cmtank} - 0.9 < V_{tune} < V_{cmtank} - 0.1$ 2: $V_{cmtank} - 1.1 < V_{tune} < V_{cmtank} - 0.9$ 3: $V_{tune} < V_{cmtank} - 1.1$ 4: $V_{cmtank} - 0.1 < V_{tune} < V_{cmtank}$ 5: $V_{tune} > V_{cmtank}$
AGCdone	AFT Status	R	1	-	AGC Settled
VGAGOK	AFT Status	R	1	-	VGA gain status 0: VGAHiGain wants to be in opposite state 1: VGAHiGain current state is ok
PD1	AFC Status	R	3	-	PD1 A/D Converter output
PD2	AFC Status	R	3	-	PD2 A/D Converter output
XLOW	TEMP Status	R	1	-	SRO Amplitude Status(0=Low, 1=ok)
AFCAD	TEMP Status	R	3	-	AFC A/D Output: 0: $< 0.75V_{dc}$ 1: $0.75V_{dc} - 1.50V_{dc}$ 2: $1.15V_{dc} - 2.25V_{dc}$ 3: $2.25V_{dc} - 3.00V_{dc}$ 4: $> 3.00V_{dc}$
TEMP	TEMP Status	R	4	-	Temperature Readout: $T = 35 + (5 \times N)$
LNAGain	UPC 1	R/W	2	0×03	LNA Gain Block: 0: 0.0dB 1: -1.0dB 2: -1.9dB 3: -2.7dB
UPCIbuf	UPC 2	R/W	2	0×00	Upconverter LO Buffer Current: $I = 1.25 - (N \times 0.14)mA$
UPCImix	UPC 2	R/W	2	0×00	Upconverter LO Output Amp. Current $I = 12.10 - (N \times 0.27)mA$

Field	Register	R/W	Bits	Default	Description
Band	UPC 1	R/W	5	0×01	Input Filter Band Center Frequency Nominal, Centers, moved by CapTrim Result) 0 : 55MHz, 1: 110MHz, 2: 165MHz 3: 220MHz, 4: 275MHz, 5: 330MHz 6: 385MHz, 7: 440MHz, 8: 495MHz 9: 550MHz, 10: 605MHz, 11: 660MHz 12: 715MHz, 13: 770MHz, 14: 825MHz 15: 880MHz, 16: 935MHz, 17: 990MHz 18: 1045MHz, 19: 1100MHz
UPCILNA	UPC 2	R/W	2	0×00	Upconverter LNA Current: 0: 21.9mA 1: 16.0mA 2: 9.4mA 3: 3.1mA
gcATTN	AGC 1 UPC 2	R/W	10	0×00 0	Front-end Attenuator digital Gain Control (Valid range 0-0×37F) $atten = (gcATTN + gcRL) \div 20dB$
gcRL	AGC 2	R/W	8	0×00	LNA Rloads digital gain control $atten = (gcATTN + gcRL) \div 20dB$
gcDNC	AGC 3	R/W	8	0×00	Downconverter digital gain control
AGCfrz	AGC4	R/W	1	0×00	Freeze AGC at its current state
gcRLmax	AGC 4	R/W	7	0×7F	Maximum gcRL value before switching to gcATTN
gcDNCmax	AGC 5	R/W	8	0×00	Maximum gcDNC value before Switching to gcRL
PD1lev	AGC 6	R/W	3	0×04	PD1 desired input level: $P_{out}(LNA) = (47 - 1.125 \times N)dBmV$
PD2lev	AGC 7	R/W	3	0×04	PD2 desired input level: $P_{out}(LNA) = (53 - 1.125 \times N)dBmV$
VGAHiGain	Misc Cntl 1	R/W	1	0×00	VGA High gain mode

Field	Register	R/W	Bits	Default	Description
VGAI	Misc Cntl 1	R/W	1	0×00	VGA Bias current: $I_{out}(\text{per leg}) = 3.5 + (N \times 1.5)\text{mA}$
DNCILO	Misc Cntl 1	R/W	1	0×00	Doconverter LO Buffer current: 0: 750uA 1: 600uA 2: 450uA 3: 250uA
DNCIbuf	Misc Cntl 1	R/W	1	0×00	Doconverter Output Buffer current: 0: 940uA 1: 753uA 2: 565uA 3: 315uA
LOrst	Misc Cntl 2	R/W	1	0×00	Rest VCO and Fractional-N accumulators
AGCrst	Misc Cntl 2	R/W	1	0×00	Rest RF AGC
CATPrst	Misc Cntl 2	R/W	1	0×00	Start a Cap Trim cycle
AUTO VGAg	Misc Cntl 2	R/W	1	0×01	Automatic VGA gain
XDIVE	Misc Cntl 2	R/W	2	0×00	SRO external divider (0 = off, 1 = ÷4, 2 = ÷2, 3 = ÷1)
LO1en	LO Cntl	R/W	1	0×01	Enable LO1 VCO (0 = disable, 1 = enable)
LO2en	LO Cntl	R/W	1	0×01	Enable LO2 VCO (0 = disable, 1 = enable)
CapTrim	Test 2	R/W	8	0×00	Results of Cap Trim cycle

10. Environment tests**10-1. Signal conditions**

- 1) RF Input level : -53dBm $\pm$ 1dBm
- 2) Video signal : EIA color bar

10-2. Test conditions & Specifications

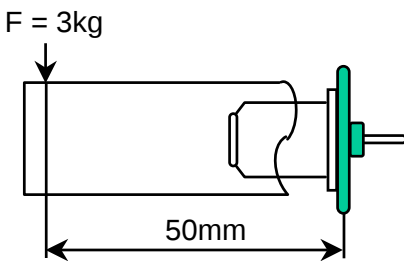
Items	Test conditions	Specifications
10-2-1. Heat load test	1. Initial value measure at standard test condition. 2. Leave samples in 70 $\pm$ 2 for 96 $\pm$ 5 hours, and in standard test condition for 30 minutes, then take measurements within 1 hour. 3. Supply voltage : standard $\pm$ 10% 4. Supply voltage cycle : 1.5h on, 0.5h off	1. Analog 1) Video output level : $\pm$ 0.2Vp-p 2) Video S/N : $\pm$ 4dB 3) Video Mod. : $\pm$ 8% 4) Video carrier frequency: $\pm$ 150kHz 5) Video carrier output level: $\pm$ 4dB 6) Audio Mod.: $\pm$ 20% 7) Audio carrier frequency: $\pm$ 20kHz 8) RF sensitivity : $\pm$ 6dB 2. Digital 1) Maximum input level : $\pm$ 6dB 2) CVBS output level : $\pm$ 0.2Vp-p
10-2-2. Humidity load test	1. Leave samples in 40 $\pm$ 5 for 24 $\pm$ 2 hours, and in standard test condition for 30 minutes, then take measurements. 2. Leave samples in 40 $\pm$ 5 80 ~ 90% rh, for 96 $\pm$ 5 hours, and in standard test condition for 30 minutes, then take measurements within 1 hour. 3. Supply voltage : standard +10% 4. Supply voltage cycle : 1.5h on, 0.5h off	1. Same as in Item 10-2-1
10-2-3. Cold test	1. Initial value measure at standard test condition. 2. Leave samples in -20 $\pm$ 2 for 96 $\pm$ 5 hours, and in standard test condition for 2 hours, then take measurements within 1 hour.	1. Same as in Item 10-2-1

10-2-4. Operating life test	1. Take measurements in standard test condition. 2. Leave samples for 1000 hours, then take measurements. 3. Supply voltage : standard	1. Same as in Item 10-2-1
10-2-5. High voltage test	1. Ant. In/Out : $\pm 15\text{kV}$ (Air Condition), 10 times (150pF charged) series $\approx 150\Omega$	1. Same as in Item 10-2-1
10-2-6. Vibration test	1. Vibration test fixture in used to vibrate the tuner with a total amplitude of 1mm and frequency ranging from 10 to 55hz, once per minute consecutively, for 40 minutes in each of three directions, x,y and z.	1. Same as in Item 10-2-1
10-2-7. Impact test	1. Impact acceleration : 50m/sec^2 2. Impact time : 11msec 3. Impact time & direction : 3 times per each 6 sides	1. Same as in Item 10-2-1

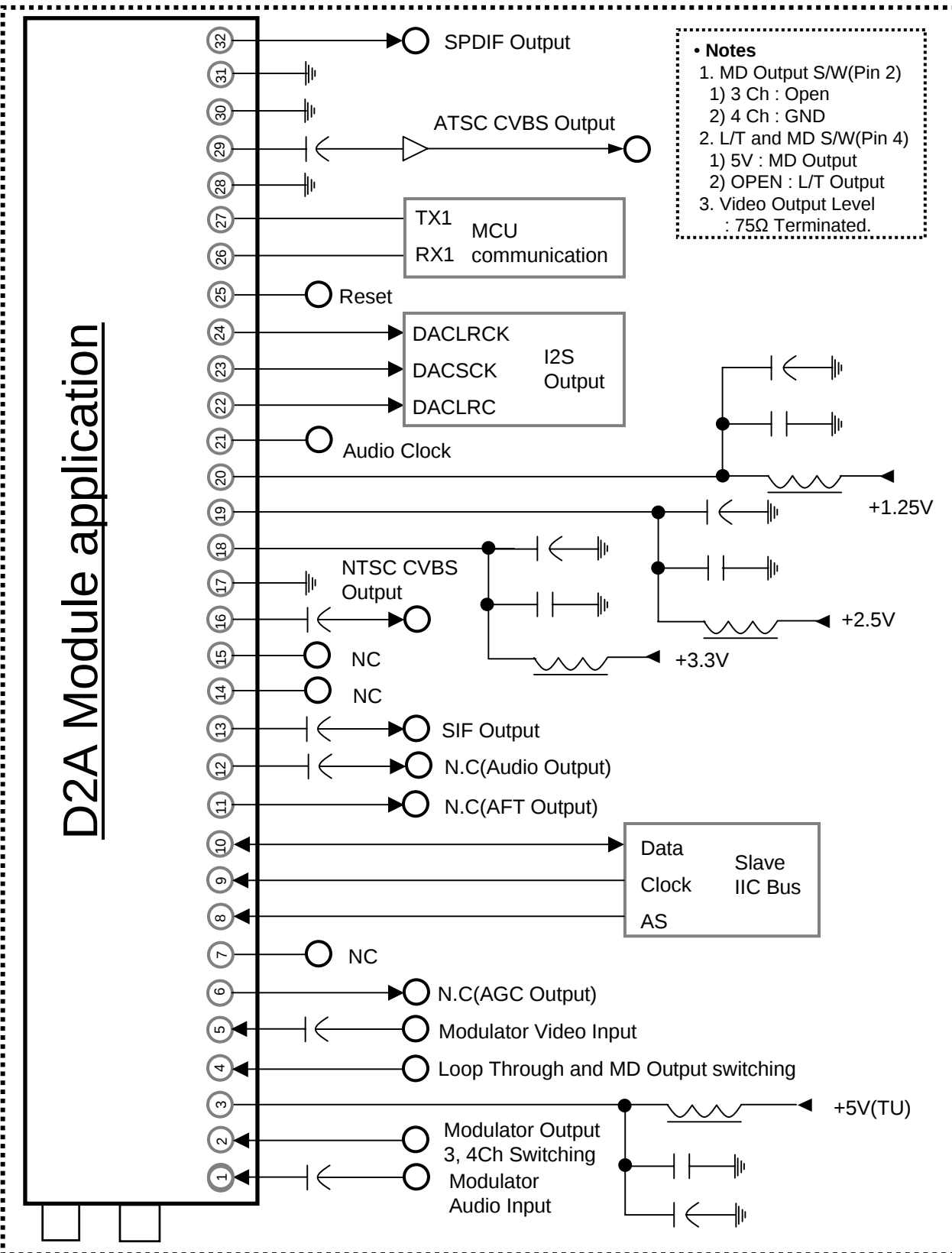
11. Mechanical characteristics

Items	Test conditions
11-1. Outline view assembly Appearance	No defects of wiring, soldering and assembling. No dirt, rust, corrosion or foreign material.
11-2. Appearance structure Dimension Mounting Weight	As assembly drawing. As assembly drawing. Approximately $60 \pm 5g$

12. Others

Items	Test conditions
12-1. Ant jack Load Test	Crack, defection and shaking should not be existed with 15kg.cm banding moment after caulking. 
12-2. Storage Environment of Tuner	Do not use or store TUNER in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture. Store the TUNER where the temperature and relative humidity do not exceed 5 to 40 and 20 to 70%. Use TUNER within 6 months. Check the solder ability in case of 6 months or more.

13. Application board

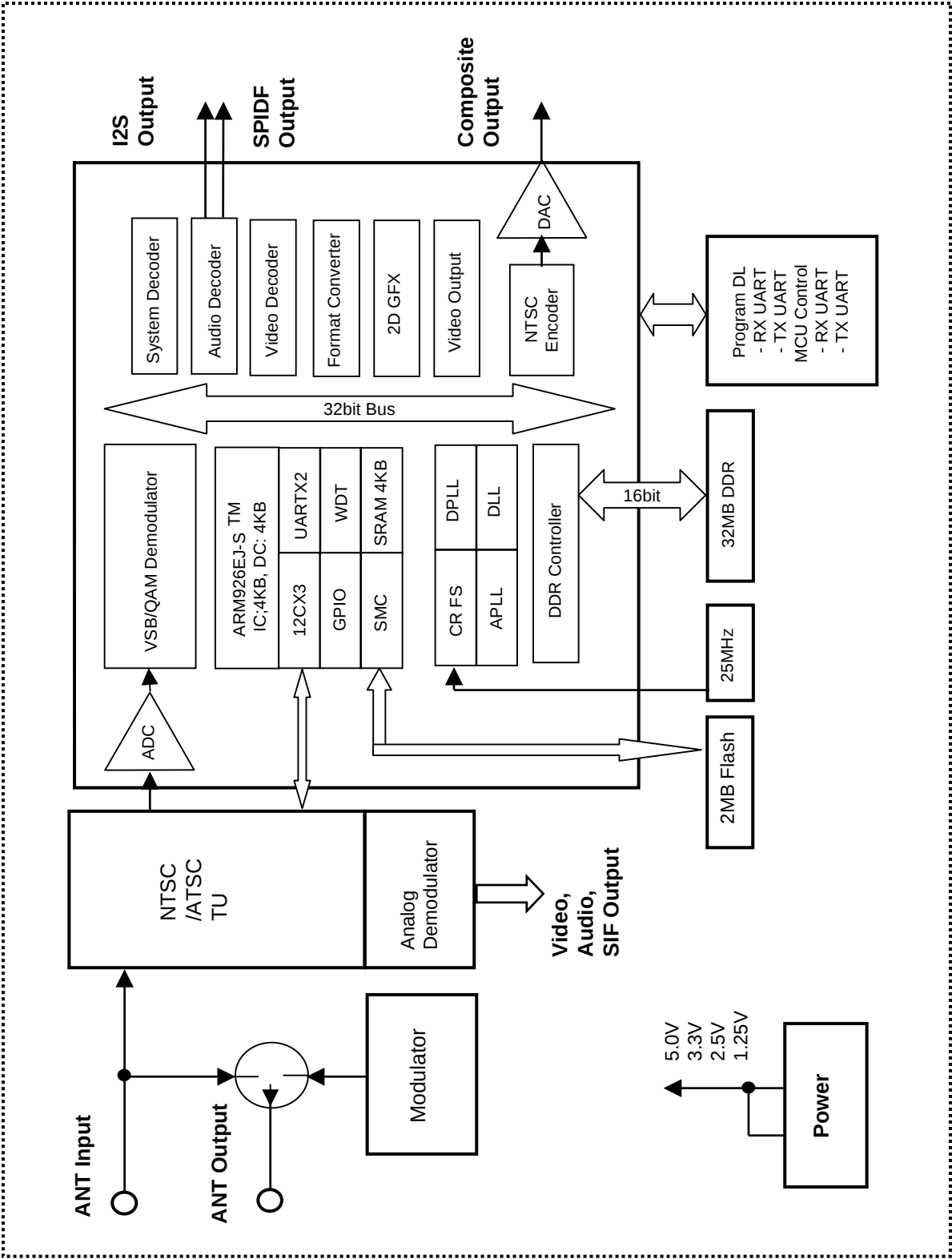


14. Pin Descriptions

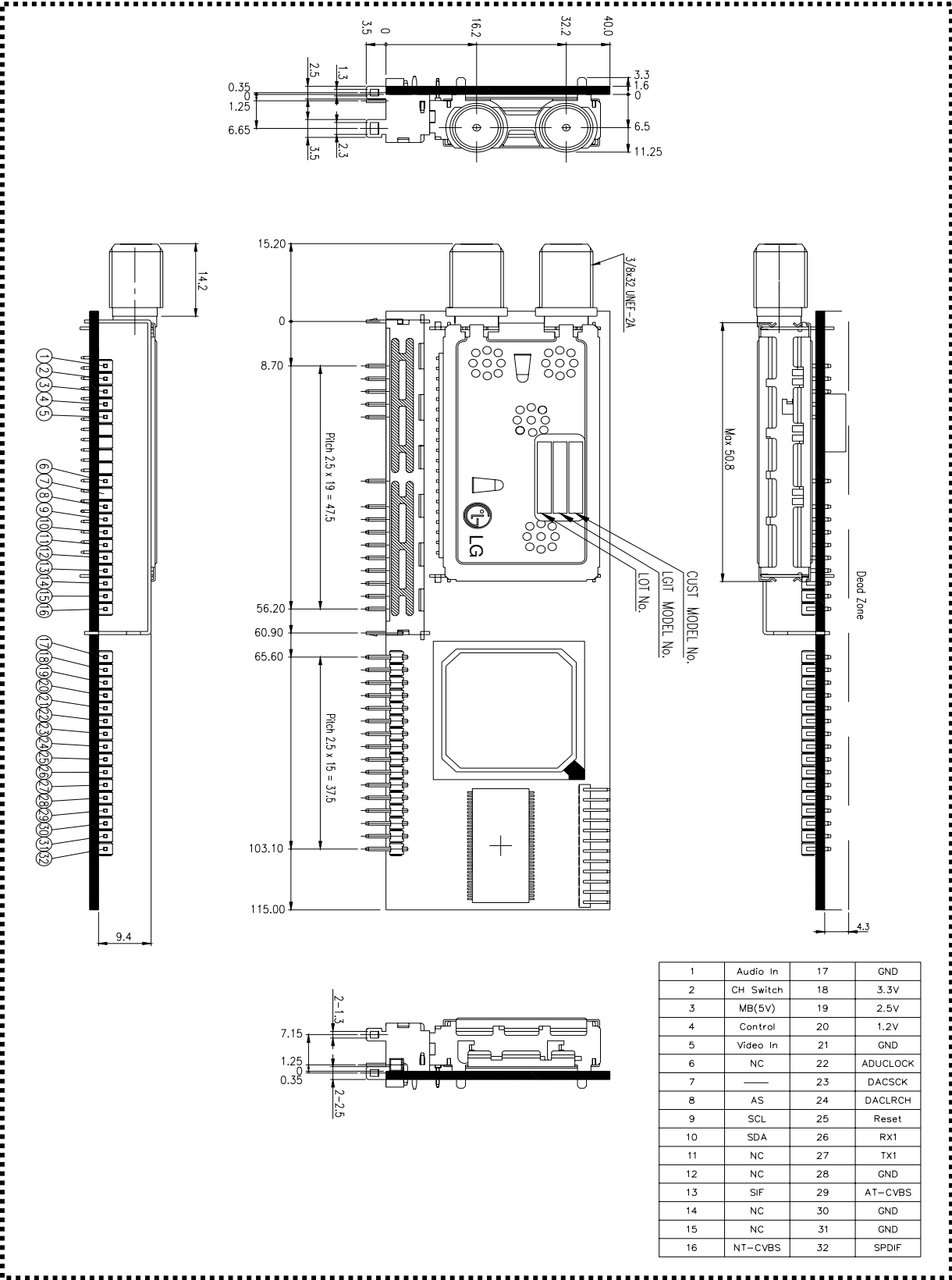
Pin No	Pin Name	Pin Description
1	Audio input	Modulator Audio Input
2	CH Switch	Modulator Output 3, 4Ch Switching (3Ch : Open, 4Ch : GND)
3	5.0V	+5.0V supply for MD, Tuner
4	Control	Loop Through and MD Output switching [(Loop Through : Open, MD: H(5V)]
5	Video input	Modulator video Input
6	N.C	Not connection(AGC Output)
7	-	-
8	AS	Slave I ² C Bus for Data(C0, for MCU communication)
9	SCL	Slave I ² C Bus for Clock(for MCU communication)
10	SDA	Slave I ² C Bus for Data(for MCU communication)
11	N.C	Not connection(AFT Output)
12	N.C	Not connection(Analog audio output)
13	SIF output	Analog SIF output
14	N.C	Not connection
15	N.C	Not connection
16	NT-CVBS	NTSC CVBS output
17	GND	Ground
18	+3.3V	+3.3V supply for Tuner, Flash, EEPROM, SDRAM, and D2A
19	+2.5V	+2.5V supply for D2A
20	+1.2V	+1.2V supply for D2A

Pin No	Pin Name	Pin Description
21	AUDCLOCK	Audio clock output
22	DACLRCK	I2S output
23	DACSCK	I2S output
24	DACLRCH	I2S output
25	Reset	Reset, active at low level. If “L” is inputted, the Tuner IC and MPEC decoder IC is initialized.
26	RX1	Reception for MCU communication
27	TX1	Transmission for MCU communication
28	GND	Ground
29	AT-CVBS	ATSC CVBS output
30	GND	Ground
31	GND	Ground
32	SPDIF	SPDIF output

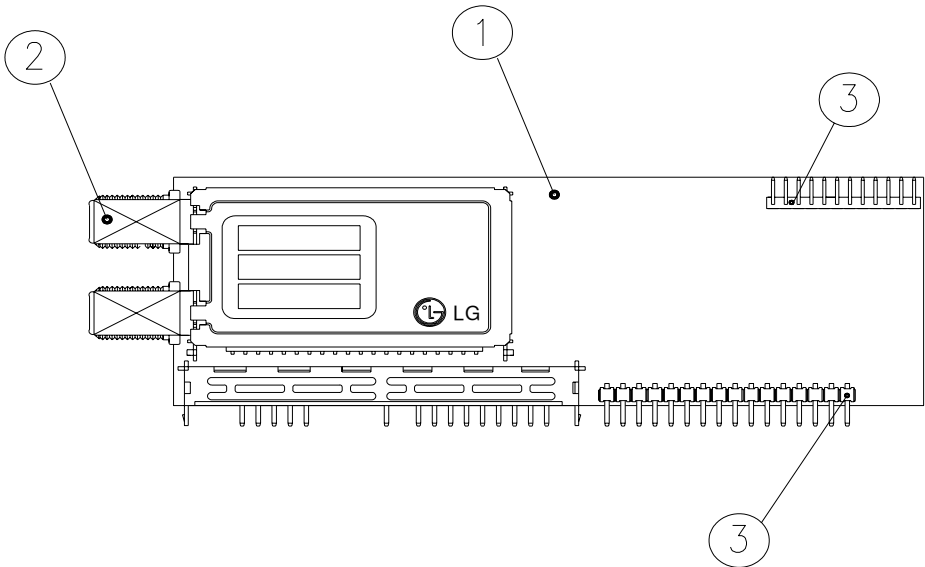
15. Block Diagram



16. Mechanical Diagram



17. Insulating material list



					LG Innotek CO., Ltd.			
					APPD. '06.12.21 Kim Byoung Yong	CHKD. '06.12.21 Lee Kap Soul	DSGD. '06.12.21 Lee Sae Hyun	NOTE TMVA-TYPE
								TITLE INSULATION MATERIAL LIST
								DOCUMENT NO. TN40139(1/5)
SYMB	NO	APPD	CHKD	DSGD				

INSULATING MATERIALS TABLE

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[illegible]

(NOTE) THE MATERIALS MARKED *IN CATEGORY NUMBER ARE CURRENT USE
AND OTHERS CAN BE USED IN THE FUTURE.

N O	DESCRIPTION	BASE MATERIALS								PRINTED WIRING BOARD			NOTE
		GENERIC I.D	MANUFACTURER	CAT. NO. OR GRADE	FLAME CLASS	HWI PLC	HAI PLC	CTI PLC	UL FILE NO	UL MARK	MANUFACTURER	FLAME CLASS	
1		EPOXY RESIN OF	DOOSAN	DS-7405	94V-0	-	4	3	E103670	 ▲	WOO HYUN ELECTRONICS	94V-0	
		COPPER CLAD	ELECTRO-								CO., LTD		
		LAMINATED SHEETS	MATERIALS								(E122869)		
			CO., LTD										
				DS-7405	94V-0	-	4	3	E103670	CJ4-V-0 ▲ or	CHEONG JU ELECTRONICS	94V-0	
											CO., LTD		
											(E104487)		
				+DS-7405	94V-0	-	4	3	E103670	 ▲	WOO SUNG PRECISION	94V-0	
											IND CO		
											(E159185)		
				+DS-7405	94V-0	-	4	3	E103670	 ▲	ACCURIS CO., LTD	94V-0	
											(E106239)		
				OAK-FR-400	94V-0	300	15	-	E39283	▲ GSEP-2302	GOLD STAR	94V-0	
											TELLECOMMUNICATION		
											CO., LTD		
											(E71042)		
		GLASSFIBER	MATSUSHITA	R-1781	94V-0	120+	200+	500	E81336	SH.S9 94V-0 ▲	SAM HAN	94V-0	
		REINFORCED EPOXY	ELECTRIC								ELECTRIC CO., LTD		
		RESIN COPPER	WORK LTD								(E94013)		
		CLAD LAMINATES											
										E4A ▲ OR	GOLD STAR		
										GSEP-2304A ▲	TELLECOMMUNICATION		
											CO., LTD		
											(E71042)		

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NO	DESCRIPTION	BASE MATERIALS								PRINTED WIRING BOARD			NOTE
		GENERIC I.D	MANUFACTURER	CAT. NO. OR GRADE	FLAME CLASS	HMM PLC	HAI PLC	CTI PLC	UL FILE NO	UL MARK	MANUFACTURER	FLAME CLASS	
2	F-CONNECTOR	DIALLYL	SUMITOMO BAKE-	*AM-100	94HB	-	-	-	E41429				
		PHthalate RESIN	LITE CO., LTD.										
		POLYPHENYLENE	TONEN CHEMICAL	HT 1301	94V-0	-	-	-	E125354				
		SULFIDE	CORP NEW										
			PRODUCT DIV										
			PHILLIPS	*R-7	94V-0	-	-	-	E54700				
			PETROLEUM	*R-4 XT	94V-0	-	-	-	E54700				
			CO., LTD.										
			TOSO SUSTEEL	GS-40	94V-0	-	-	-	E102861				
			CO., LTD.										
		POLYAMIDE NYLON	E I DUPOINT DE	HTNFR51G35L	94V-0	-	-	-	E41938				
		RESIN	NEMOURS &										
			CO., INC										

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NO	DESCRIPTION	BASE MATERIALS								PRINTED WIRING BOARD			NOTE
		GENERIC I.D	MANUFACTURER	QAT. NO. OR GRADE	FLAME CLASS	HWI PLO	HAI PLO	CTI PLO	UL FILE NO	UL MARK	MANUFACTURER	FLAME CLASS	
3	COMPOUND	POLYPHENYLENE	DAI NIPPON	FZ1140	94V-0	3	4	-	E53829				
	TERMINAL	SULFIDE	INK & CHEMICALS										
			INC										
		POLYAMIDE NYLON	E I DUPONT DE	HTNFR51035L	94V-0	-	-	-	E41938				
		RESIN	NEWKORS &										
			CO., INC.										
		POLYAMIDE NYLON	HYOSUNG T&C	24130W	94V-0	-	-	-	E70848(W)				
		RESIN	CO., LTD PP DIV										
		POLYAMIDE NYLON	E I DUPONT DE	*70332H31L	HB	4	0	-	E41938				
		RESIN	NEWKORS &										
			CO., INC.										
		POLYAMIDE NYLON	WITBUI	*E430N(T5)	94V-0	-	-	-	E52579(W)				
		RESIN	CHEMICALS, INC.										