Halogen Free

Pre Specification

DIVERSITY Front End Module

(Diversity FEM)

CUSTOMER :

MODEL : **SFMR8C0C001**

DOC. No. : **SMS-51-L-SFT FV-124**

DATE : **12. July. 2017**

REVISION : **Preliminary**

WISOL					
ISSUED BY		CHECKED BY		APPROVED BY	
CUSTOMER					
ISSUED BY		CHECKED BY		APPROVED BY	

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1. REVISION HISTORY

001	11. May. 2017	All Pages	Make out the Pre Specification
002	31. May. 2017	P12~13	Modify MIPI Register Map
003	15. JUN. 2017	P12~13	Modify MIPI Information (verI2.0 -> ver1.1)
004	12. July. 2017	P8~11	Modify Specification Data
		P16	Modify Blcok Diagram
		P17	Add Application Note

2. DEFINITION

2-1. PART NO.

S F	M	R	8	C0	C0	0 1
①	②	③	④	⑤	⑥	⑦

No.	EXPLANATION
①	SAW Filter
②	Module
③	Application (RFEM)
④	Application Band Number
⑤	Type : C0
⑥	Package size: 3.2x3.0 mm²
⑦	Design Revision (01: default)

2-2. FEATURES

- Module Size : 3.2 x 3.0 x 0.7 mm^3
- MSL Level : 3
- ESD-Protected RF input: TBD
- Diversity Rx SAW Module with Integrated Filters, Switch, Matching Components,

2-3. APPLICATION

- B1, B3, B5, B8, B34, B39, B40, B41
- AUX Out (x4)

3. PRECAUTIONS

3-1. This device should not be used in any type of fluid such as water, oil, organic solvent, etc.

3-2. This is a hermetic device.
MSL(Moisture Sensitivity Level) is the '3' level.

3-3. Ultrasonic cleaning shall be avoided.

3-4. Isopropyl Alcohol and Ethyl Alcohol can be used for cleaning. Contact us before using other cleaning solvents than above

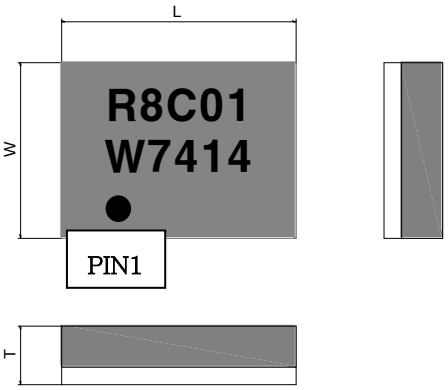
3-5. This is an electrostatic sensitive device.
Please avoid static voltage during operation and storage.

3-6. Sudden change of temperature shall be avoided, deterioration of the characteristics can occur.

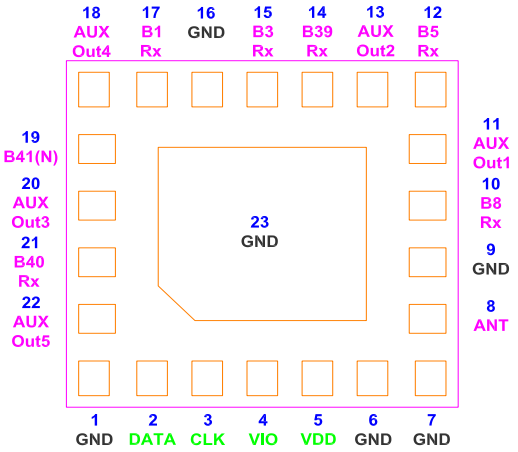
3-7. If any malfunction due to designing or manufacturing which is out of specification occurs within one year after the products have been delivered, the maker should exchange the defective products.

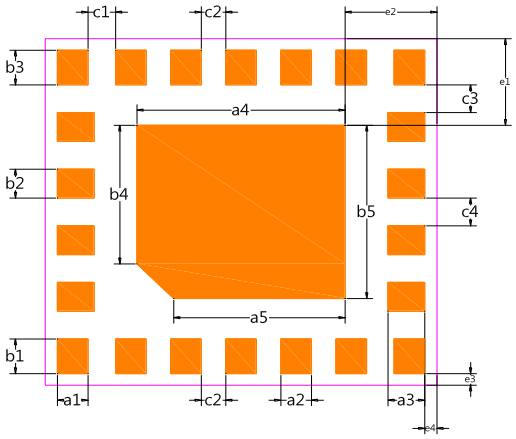
4. OUTLINE DRAWING & DIMENSIONS

[Top View]



[Top View]





[Dimension] **[Unit : mm]**

Mark	Dimension	Mark	Dimension	Mark	Dimension
L	3.2 ± 0.10	a5	1.40 ± 0.05	c2	0.20 ± 0.05
W	3.0 ± 0.10	b1	0.30 ± 0.05	c3	0.24 ± 0.05
T	0.65± 0.05	b2	0.25 ± 0.05	c4	0.24 ± 0.05
a1	0.25 ± 0.05	b3	0.30 ± 0.05	e1	0.75 ± 0.10
a2	0.25 ± 0.05	b4	1.20 ± 0.05	e2	0.75 ± 0.10
a3	0.30 ± 0.05	b5	1.50 ± 0.05	e3	0.10 ± 0.10
a4	1.70 ± 0.05	c1	0.225 ± 0.05	e4	0.10 ± 0.10

[Pin Assignment]

Pin No.	Pin Name	Description
1	GND	RF and DC Ground
2	SDATA	MIPI Data
3	SCLK	MIPI Clock
4	VIO	Voltage for the MIPI logic
5	VDD	Power Supply Voltage
6	GND	RF and DC Ground
7	GND	RF and DC Ground
8	ANT	Antenna Port
9	GND	RF and DC Ground
10	Band8 Rx	Band8 Rx Port
11	AUX Out1	Additional port for SAW Filter Input
12	Band5 Rx	Band5 Rx Port
13	Band34 Rx	Band34 Rx Port
14	Band39 Rx	Band39 Rx Port
15	Band3 Rx	Band3 Rx Port
16	GND	RF and DC Ground
17	Band1 Rx	Band1 Rx Port
18	AUX Out2	Additional port for SAW Filter Input
19	Band41 Rx	Band41 Rx Port
20	AUX Out3	Additional port for SAW Filter Input
21	Band40 Rx	Band40 Rx Port
22	AUX Out4	Additional port for SAW Filter Input
23	GND	RF and DC Ground

5. MARKING

- R8C
  - 'R8C' indicates the abbreviation of Diversity RFEM 'SFMR8C0C001"

- 01
  - '01' indicates the order of Marking.

- W7414
  - 'W' indicates Wisol, '7' → year , '4' →month and '14'→day

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Mark	4	5	6	7	8	9	0	1	2	3	4	5

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

Day	1	2	3	4	----------→	29	30	31
Mark	01	02	03	04	----------→	29	30	31

6. SPECIFICATION

6-1. Band 1 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
Operating Frequency	-	MHz	2110	-	2170	
Insertion Loss	S_{21}	dB	-	2.79	-	
Attenuation	S_{21}	dB	-	46.4	-	824~849MHz
			-	44.2	-	1710~1785MHz
			-	43.7	-	1920~1980MHz
Input VSWR	S_{11}	dB	-	1.58	-	
Output VSWR	S_{22}	dB	-	1.86	-	
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		40+j10			

Note : 1) Please refer to the Application Note at 7-7

6-2. Band 3 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
Operating Frequency	-	MHz	1805	-	1880	
Insertion Loss	S_{21}	dB	-	2.88	-	
Attenuation	S_{21}	dB	-	37.0	-	824~849MHz
			-	36.9	-	1710~1785MHz
			-	35.8	-	1920~1980MHz
Input VSWR	S_{11}	dB	-	1.56	-	
Output VSWR	S_{22}	dB	-	1.69	-	
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		50+j20			

Note : 1) Please refer to the Application Note at 7-7

6-3. Band 5 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
Operating Frequency	-	MHz	869	-	894	
Insertion Loss	S_{21}	dB	-	2.39	-	
Attenuation	S_{21}	dB	-	33.7	-	824~849MHz
			-	40.8	-	1710~1785MHz
			-	45.6	-	1920~1980MHz
Input VSWR	S_{11}	dB	-	1.32	-	
Output VSWR	S_{22}	dB	-	1.38	-	
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		50+j5			

Note : 1) Please refer to the Application Note at 7-7

6-4. Band 8 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
Operating Frequency	-	MHz	925	-	960	
Insertion Loss	S_{21}	dB	-	2.35	-	
Attenuation	S_{21}	dB	-	32.9	-	880~915MHz
Input VSWR	S_{11}	dB	-	2.49	-	
Output VSWR	S_{22}	dB	-	2.28	-	
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		40+j5			

Note : 1) Please refer to the Application Note at 7-7

6-5. Band 34 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
Operating Frequency	-	MHz	2010	-	2025	
Insertion Loss	S_{21}	dB	-	1.91	-	
Attenuation	S_{21}	dB	-	40.6	-	1710~1785MHz
			-	35.6	-	2400~2500MHz
Input VSWR	S_{11}	dB	-	1.48	-	
Output VSWR	S_{22}	dB	-	1.16	-	
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		40+j10			

Note : 1) Please refer to the Application Note at 7-7

6-6. Band 39 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
Operating Frequency	-	MHz	1880	-	1920	
Insertion Loss	S_{21}	dB	-	2.23	-	
Input VSWR	S_{11}	dB	-	1.37	-	
Output VSWR	S_{22}	dB	-	1.59	-	
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		30+j10			

Note : 1) Please refer to the Application Note at 7-7

6-7. Band 40 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
Operating Frequency	-	MHz	2300	-	2400	
Insertion Loss	S_{21}	dB	-	2.21	-	
Input VSWR	S_{11}	dB	-	1.80	-	
Output VSWR	S_{22}	dB	-	1.85	-	
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω] 1)	Output Port		40			Shunt L: 3.0nH

Note : 1) Please refer to the Application Note at 7-7

6-8. Band 41 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
Operating Frequency	-	MHz	2535	-	2655	
Insertion Loss	S_{21}	dB	-	3.19	-	
Input VSWR	S_{11}	dB	-	1.92	-	
Output VSWR	S_{22}	dB	-	2.10	-	
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		50			Shunt L: 3.6nH

Note : 1) Please refer to the Application Note at 7-7

6-9. AUX Out1 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Min.	Min.	
Operating Frequency	-	MHz	700	-	2700	
Insertion Loss	S_{21}	dB	-	0.42	-	700~960MHz
			-	0.58	-	1710~2170MHz
			-	0.68	-	2300~2700MHz
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		40+j5			

Note : 1) Please refer to the Application Note at 7-7

6-10. AUX Out2 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Min.	Min.	
Operating Frequency	-	MHz	700	-	2700	
Insertion Loss	S_{21}	dB	-	0.46	-	700~960MHz
			-	0.70	-	1710~2170MHz
			-	0.83	-	2300~2700MHz
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		40+j5			

Note : 1) Please refer to the Application Note at 7-7

6-11. AUX Out3 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Min.	Min.	
Operating Frequency	-	MHz	700	-	2700	
Insertion Loss	S_{21}	dB	-	0.46	-	700~960MHz
			-	0.67	-	1710~2170MHz
			-	0.76	-	2300~2700MHz
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		45			

Note : 1) Please refer to the Application Note at 7-7

6-12. AUX Out4 at 25℃, PIN = 0 dBm

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Min.	Min.	
Operating Frequency	-	MHz	700	-	2700	
Insertion Loss	S_{21}	dB	-	0.44	-	700~960MHz
			-	0.65	-	1710~2170MHz
			-	0.85	-	2300~2700MHz
Impedance [Ω] 1)	Ant Port		50			Shunt C:1pF + Series L : 2.4nH
Impedance [Ω]	Output Port		45			

Note : 1) Please refer to the Application Note at 7-7

6-13. RSE test

Parameter	Symbol	Unit	Target Specifications			Note
			Min.	Typ.	Max.	
RSE Case 2 (@ Isolation mode)	2nd Harmonics	dBm	-	TBD	-40.0	Phase, Jammer=26dBm, @902.4MHz 1)
	3rd Harmonics	dBm	-	TBD	-40.0	
	4th Harmonics	dBm	-	TBD	-40.0	
	5th Harmonics	dBm	-	TBD	-40.0	
	6th Harmonics	dBm	-	TBD	-40.0	

Note : 1) GSM CW Signal Apply to Module ANT port

7. PERFORMANCE

7-1. Maximum Ratings at TA = 25℃

Parameters	RATINGS	UNITS
Supply Voltage (VDD)	-0.5 ~ 3.6	V
RFFE Supply Voltage (VIO)	-0.5 ~ 3.6	V
RFFE Control Voltage (SCLK, SDATA)	-0.7 ~ 3.6	V
Operating Temperature Range	－30 ~ ＋85	℃
Storage Temperature Range	－40 ~ ＋125	℃

7-2. Operation Ranges

Parameters	Values			Unit
	Min.	Typ.	Max.	
Supply Voltage (Vdd)	2.30	2.80	3.40	V
Supply Current (I_{DD})	-	51	-	uA
RFFE Supply Voltage (VIO)	1.10	1.80	1.95	V
RFFE Input Control Voltage High[1)]	0.7*VIO	-	1.0*VIO	V
RFFE Input Control Voltage Low[1)]	0.0*VIO	-	0.3*VIO	V
RFFE Output Control Voltage High[1)]	0.8*VIO	-	1.0*VIO	V
RFFE Output Control Voltage Low[1)]	0.0*VIO	-	0.2*VIO	V

Note : [1)]SCLK and SDAT

7-3. MIPI Timing Specification

Parameter	Symbol	Values			Unit	Note/Test condition
		Min.	Typ.	Max.		
SCLK Frequency	FSCLK	0.032	-	26	MHz	Write
		0.032		13	MHz	Read
SDATA Setup Time[1)]	TS	1	-	-	ns	
SDATA Hold Time[1)]	TH	5	-	-	ns	
SDATA Release Time	TSDATAZ	-	-	10	ns	
Time for Data Output[2)]	TD	-	-	25	ns	
SDATA Rise/Fall Time	TSDATAOTR	2.1	-	15	ns	
VIO Supply Rise Time	TVIO-R	-	-	400	us	
RFFE I/O Voltage Reset Timing	TVIO-RST	10	-	-	us	
Signal Reset Delay Time	TSIGOL	120	-	-	ns	
RF Switching Time	TSW	-	3	5	us	
Power Up setting Time	Tpup	-	-	4.75	us	

7-4. MIPI Register Map of Switch

Register Address	Bits	Register Name	Default	Description
0x 00 [1)]	[7:0]	Register_0	0x 00	Mode Control
0x 01 [1)]	[7:0]	Register_1	0x 00	Mode Control
0x 1D	[7:0]	PRODUCT_ID	0010 1111	Read Only
0x 1E	[7:0]	MANUFACTURER_ID	0010 0110	Read Only
0x 1C	[7:6]	Power Mode	0x 80 [2)]	00b: Normal operation (ACTIVE) 01b: Default settings (STARTUP) 10b: Low power (LOW POWER) 11b: Reserved
0x 1F	[7:6] [5:4] [3:0]	Reserved Manufacturer ID USID[4)]	00b 01b 1000b	Spare Read Only R/W. Programmable USID
0x 1A	[7:0]	RFFE Status	0x 00	-
0x 1B	[3:0]	Group_SID	0x 00	R/W. Programmable GSID

Note : [1)] Register_0 and Register_1 are used for control the RF switch state.

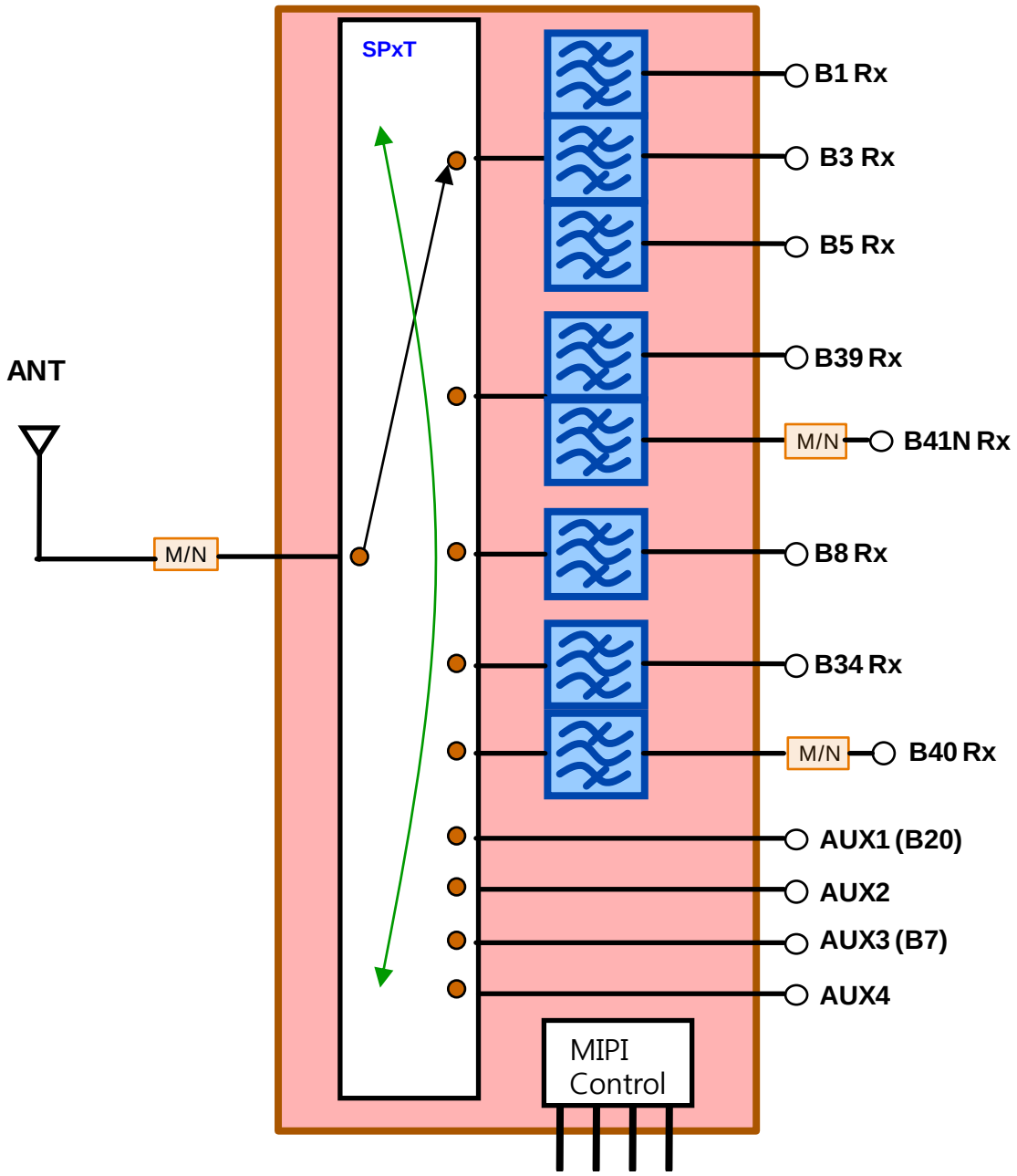
[2)] Power-up sequence ends in LOW POWER mode

7-5. Truth Table

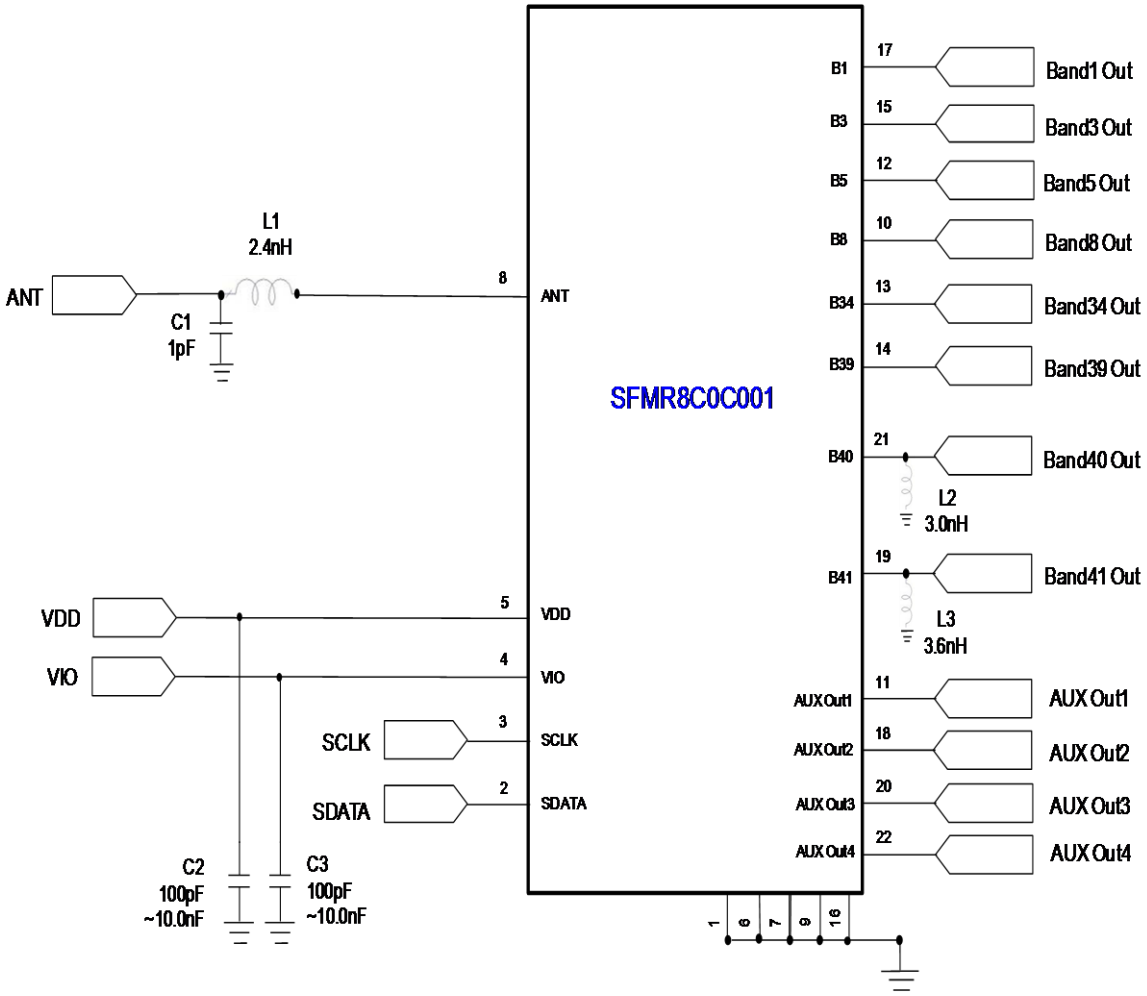
Swithch Contorl Register																	
Channel	Band	Register_0_Address 0x00								Register_1_Address 0x01							
		D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	D5	D4	D3	D2	D1	D0
1	B1	X	X	X	X	X	X	X	**1**	X	X	X	X	X	X	X	X
2	B3	X	X	X	X	X	X	X	**1**	X	X	X	X	X	X	X	X
3	B8	X	X	X	X	X	X	**1**	X	X	X	X	X	X	X	X	X
4	B5	X	X	X	X	X	X	X	**1**	X	X	X	X	X	X	X	X
5	B34	X	X	**1**	X	X	X	X	X	X	X	X	X	X	X	X	X
6	B39	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**1**	X
7	B40	X	**1**	X	X	X	X	X	X	X	X	X	X	X	X	X	X
8	B41	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**1**	X
9	AUX 1	X	X	X	X	X	**1**	X	X	X	X	X	X	X	X	X	X
10	AUX 2	X	X	X	X	X	X	X	X	X	X	X	X	**1**	X	X	X
11	AUX 3	X	X	X	X	X	X	X	X	X	X	X	X	X	**1**	X	X
12	AUX 4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**1**
All Isolation		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Note : [1)] Please refer to the Block Diagram at 7-6.

7-6. Block Diagram

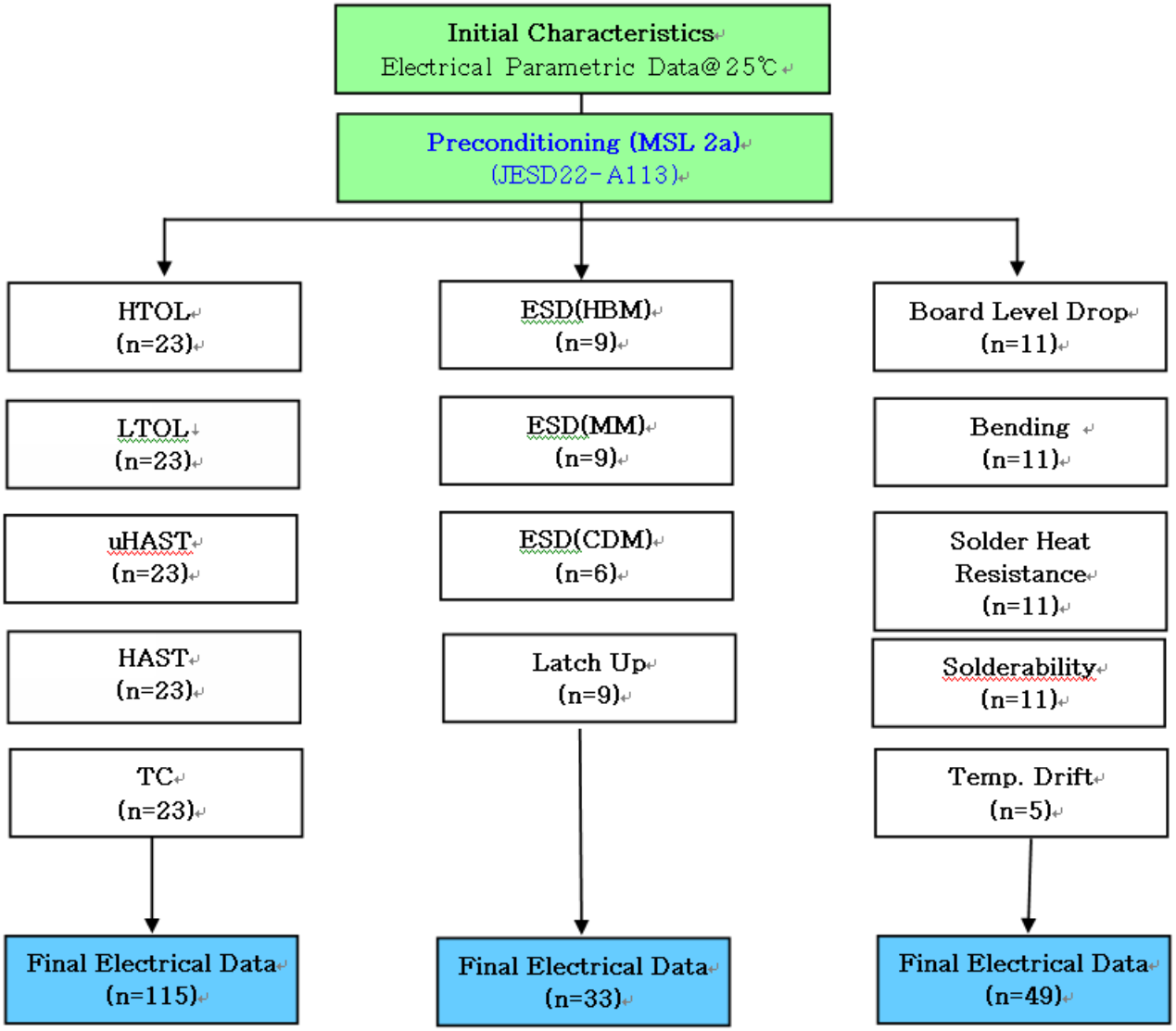


7-7. Application Note



8. RELIABILTIY

8-1. Engineering Sample Flow Chart

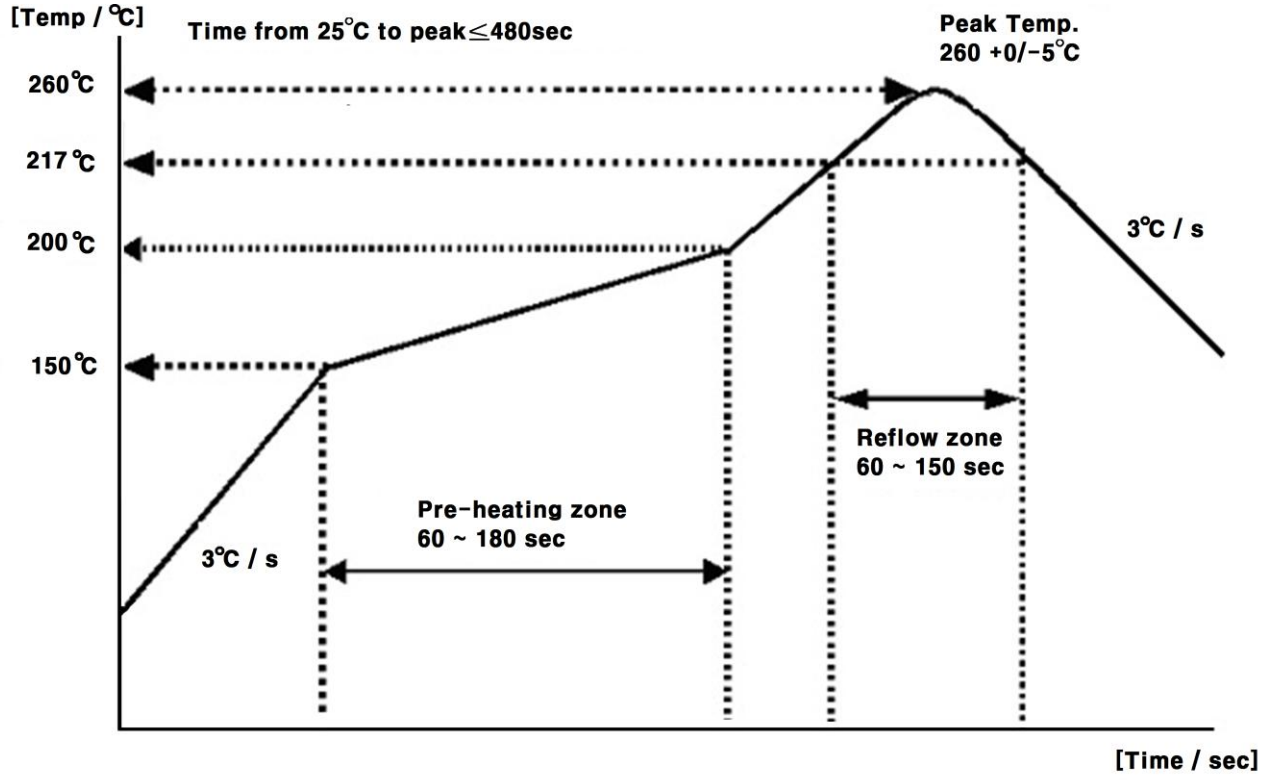


8-2. Test Item & Condition

CATEGORY	TEST ITEM	TEST CONDITION	REMARK
Preconditioning		Bake + Soak(MSL or above) + 3X Reflow DURATION (Soak 60℃ 60% 120HR)	JESD22-A113

Test Item	DESCRIPTION	TEST CONDITION	DURATION
HTOL (High Temperature Operating Life)	JESD22-A108	125℃ /Max Vcc /Dynamic	1000hr
LTOL (Low Temperature Operating Life)	JESD22-A108	-40℃ /Max Vcc /Dynamic	1000hr
uHAST (Unbiased HAST)	JESD22-A118	130℃ /85% /33.3psi	96hr
HAST (Highly Accelerated Stress Test)	JESD22-A110	130℃ /85% RH /Max Vcc	168hr
TC (Temperature Cycle)	JESD22-A104	Condition G (-40℃ /125℃)	1000cycle
ESD(HBM)	JESD22-A114	1000V or above	-
ESD(MM)	JESD22-A115	No spec but need data	-
ESD(CDM)	JESD22-C101	500V or above	-
Latch Up	JESD78	No spec but need data	-
Board Level Drop Test	JESD22-B111	1500G Duration 0.5ms	150cycle
Bending Test		0.5㎜/sec 3times (1mm distance)	
Solder Heat Resistance		260℃	10sec
Solderability		235℃	3sec
Temp. Drift		-40℃ → +25℃ → +125℃	Each Option,2HR

9. REFLOW CONDITION



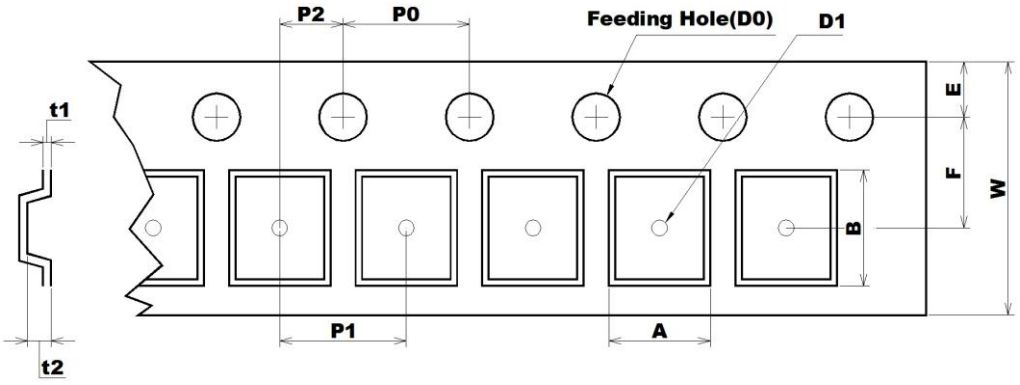
** REMARK) IPC/JEDEC J-STD-020 Revision C (proposed standard for ballot January 2004)

CTQ Process Management Point		Spec		Cpk
		LSL	USL	
Reflow	THE MAXIMU TEMPERATURE[℃]	235	245	1.48
	DURATION OVER 220℃[sec]	40		1.66

10. PACKING

10-1. Dimensions

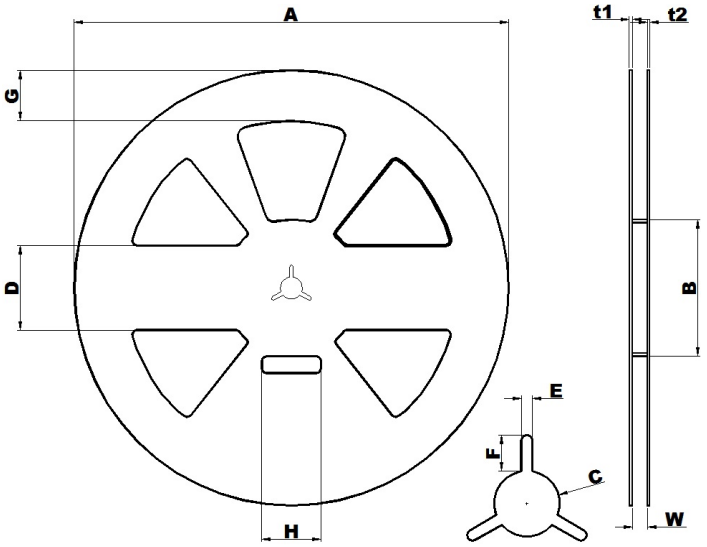
- Carrier Tape



[Unit: mm]

A	B	D0	D1	E	F	P0	P1	P2	t1	t2	W
3.20 +0.05 −0.05	3.45 +0.05 −0.05	Ø1.50 +0.10	Ø1.50 +0.25	1.75 +0.10 −0.10	5.50 +0.05 −0.05	4.00 +0.10 −0.10	8.00 +0.10 −0.10	2.00 +0.05 −0.05	0.3 +0.05 −0.05	1.10 +0.10 −0.10	12.00 +0.30 −0.10

- Reel



[Unit: mm]

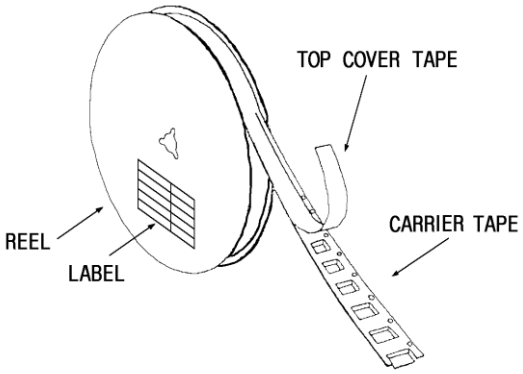
A	B	C	D	E	F	G	H	t1	t2	W
Ø258.0 +1.0 −0.5	Ø81.0 +1.0 −1.0	Ø13.0 +0.5 −0.5	50.0 +0.8 −0.8	2.2 +0.3 −0.3	7.0 +0.5 −0.5	30.0 +0.8 −0.8	35.0 +1.0 −1.0	1.8 +0.5 −0.5	1.5 +0.5 −0.5	13.0 +1.0 −0.5

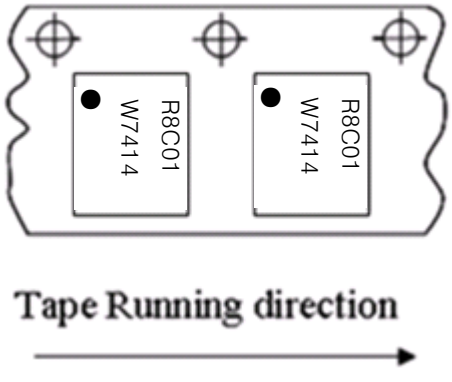
10-2. Reeling Quantity

10 Inch Reel: 2,000 pcs/reel

10-3. Taping Structure

The tape shall be wound around the reel in direction shown below





Bar Code Label

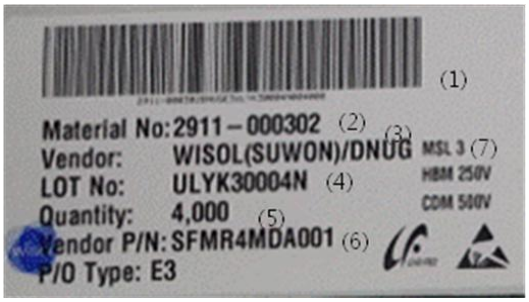
(1) Barcode

(2) SFMR5M0K001 Model Name

(3) NSMXB4001 Reel Number.

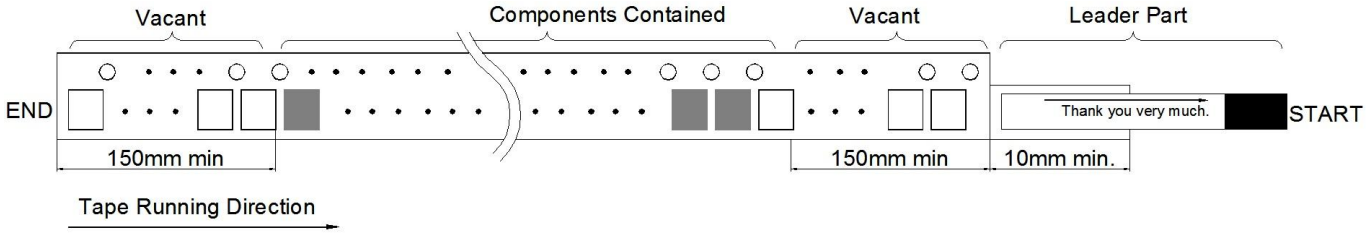
(4) 2,000 Quantity

ⓑ Customers Label



No.	Description
(1)	Model Name Barcode
(2)	Code Number
(3)	Vendor
(4)	LOT No.
(5)	Quantity
(6)	Part Name
(7)	MSL Level(Level)

Leader part and vacant position specifications

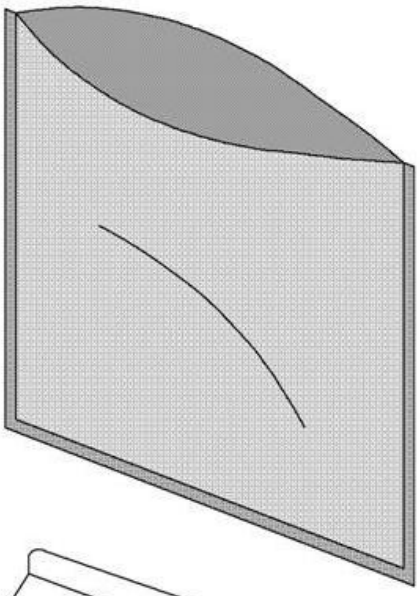


10-4. Inner Box(Reeling Packing) Structure

Material: Polycarbonate

Material : Polyethylene + Aluminum

Size : 310×370mm^2



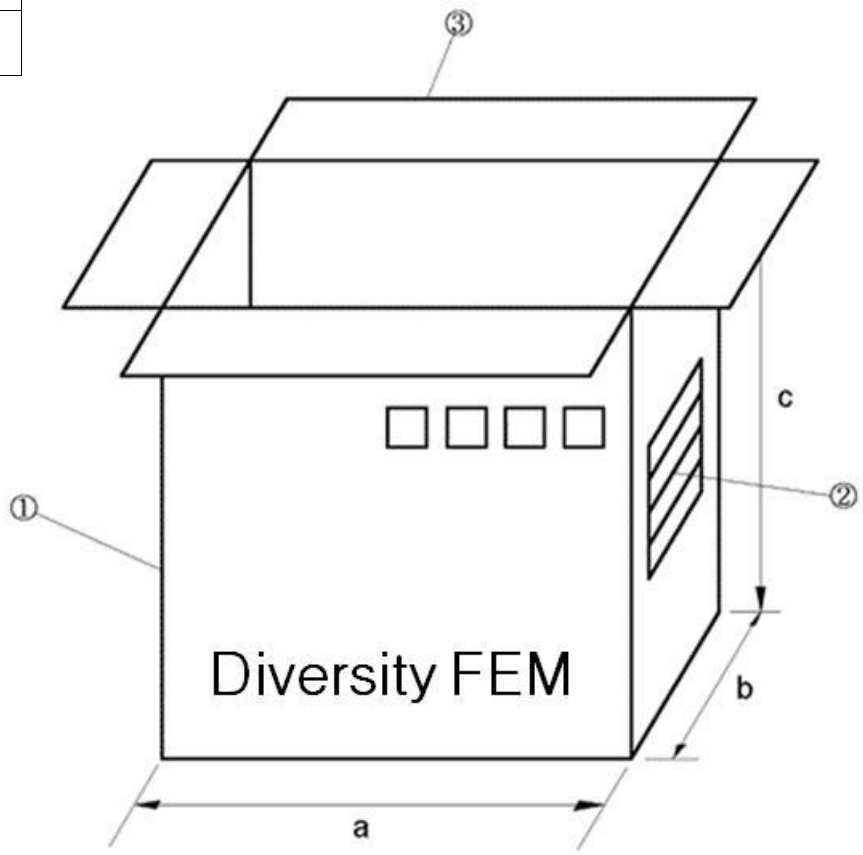
Material : Paper

Size: (D)257×(W)40×(H)260mm^3

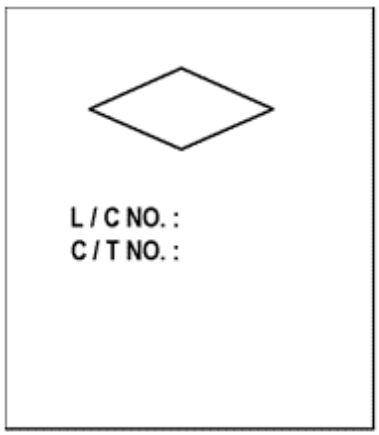
10-5. Outer Box Structure

Material : Paper

TYPE	SIZE(mm)			Inner Box #
	a	b	c	
A	273	250	280	6 boxes



SIDE ①



SIDE ②

MODEL	
Q'TY	EA
USER	
DATE	. .

- SIDE is the same as front side.