SCP-5000 Parts List

Ref NO.	Description	Ref NO.	Description	Ref NO.	Description	Ref NO.	Description
L1001	6.8nH						
L1003	8.2nH						
L1005	5.6nH						
L1101	4.7nH						
L1103	6.8nH						
L1104	150nH						
L1106	27nH						
L1107	10nH						
L1108	8.2nH						
L1109	47nH						
L1110	47nH						
L1111	120nH						
L1112	120nH						
L1115	39nH						
L1116	47nH						
L1118	5.6nH						
L1119	6.8nH						
L1120	2.2nH						
L1121	220nH						
L1122	220nH						
L1123	3.3nH						
L1130	2.2nH						
L1201	12nH						
L1202	12nH						
L1203	56nH						
L1204	56nH						
L1301	27nH						
L1302	27nH						
L1303	4.7nH						
L1304	4.7nH						
L1305	10nH						
L1308	22nH						
L1401	3.9nH						
L1402	1.5nH						
L1403	12nH						
L1404	15nH						
L1405	10nH						
L1406	1.2nH						
L1420	5.6nH						
L1422	6.8nH						
L1430	2.7nH						
L1431	2.7nH						
L1432	4.7nH						
L1433	4.7nH						

SCP-5000 Parts List

Ref NO.	Description	Ref NO.	Description	Ref NO.	Description	Ref NO.	Description
C1001	1.5pF	C1313	100pF	C1521	10uF		
C1002	8pF	C1314	0.01uF	C1522	0.01uF		
C1005	100pF	C1315	47pF	C1523	1000pF		
C1100	0.01uF	C1316	47pF	C1524	100pF		
C1101	1pF	C1317	47pF	C1525	100pF		
C1102	0.1uF	C1318	100pF	C1526	1000pF		
C1108	1000pF	C1319	8pF	C1527	1000pF		
C1109	1000pF	C1320	3300pF	C1528	1000pF		
C1110	2pF	C1321	3300pF	C1529	0.01uF		
C1111	100pF	C1322	100pF	C1530	4700pF		
C1112	1000pF	C1323	1000pF	C1531	0.47uF		
C1113	100pF	C1324	0.01uF	C1532	0.022uF		
C1114	10pF	C1325	0.01uF	C1540	0.1uF		
C1115	100pF	C1326	1000pF	C1603	1000pF		
C1117	0.1uF	C1327	0.022uF	C1801	100pF		
C1118	56pF	C1328	0.47uF	C1802	100pF		
C1119	100pF	C1329	560pF	C1803	1uF		
C1120	1000pF	C1330	1000pF	C1804	2.2uF		
C1121	18pF	C1331	100pF	C1805	2.2uF		
C1122	1.5pF	C1332	100pF	C1807	100pF		
C1123	0.01uF	C1333	12pF	C1808	1uF		
C1124	12pF	C1334	0.1uF	C1809	2.2uF		
C1127	100pF	C1335	4pF	C1810	2.2uF		
C1128	100pF	C1336	4pF	C1811	1uF		
C1130	1pF	C1403	100pF	C1813	10uF		
C1135	39pF	C1404	100pF				
C1136	39pF	C1405	1000pF				
C1139	100pF	C1406	1000pF				
C1140	1000pF	C1407	1000pF				
C1141	33pF	C1410	10pF				
C1142	1000pF	C1411	10pF				
C1143	100pF	C1412	10pF				
C1144	1000pF	C1413	0.01uF				
C1145	33pF	C1414	9pF				
C1146	1000pF	C1415	15pF				
C1147	3pF	C1416	15pF				
C1148	0.01uF	C1417	4.7uF				
C1153	2pF	C1418	15pF				
C1154	10pF	C1419	15pF				
C1155	100pF	C1420	6pF				
C1160	1000pF	C1421	3pF				
C1165	0.5pF	C1422	15pF				
C1168	1.5pF	C1423	10pF				
C1201	0.01uF	C1425	100pF				
C1202	4700pF	C1426	1uF				
C1203	1000pF	C1427	100pF				
C1206	0.01uF	C1428	1uF				
C1208	0.01uF	C1429	100pF				
C1209	0.01uF	C1430	100pF				
C1210	0.22uF	C1431	0.01uF				
C1211	1000pF	C1434	1000pF				
C1212	1000pF	C1435	1000pF				

C1213	0.01uF	C1438	1.5pF				
C1214	100pF	C1445	1000pF				
C1215	0.01uF	C1450	4pF				
C1216	1000pF	C1501	0.01uF				
C1217	22pF	C1503	100pF				
C1219	22pF	C1504	1uF				
C1305	22pF	C1505	0.1uF				
C1308	1000pF	C1506	1000pF				
C1309	0.1uF	C1507	10uF				
C1310	4700pF	C1508	0.022uF				
C1311	0.1uF	C1509	0.22uF				
C1312	0.01uF	C1520	0.01uF				

SCP-5000 Parts List

Ref NO.	Description	Ref NO.	Description	Ref NO.	Description	Ref NO.	Description
R1001	0	R1419	1.2k				
R1002	0	R1420	0				
R1005	0	R1426	0				
R1101	0	R1428	0				
R1105	0	R1500	0				
R1106	6.8k	R1501	680				
R1108	10	R1502	15k				
R1109	3.3k	R1503	47k				
R1110	1k	R1504	4.7k				
R1112	8.2k	R1505	120k				
R1114	68	R1506	100k				
R1115	10	R1507	4.7k				
R1116	10	R1508	10k				
R1120	4.7k	R1509	27				
R1121	10k	R1510	1k				
R1201	1k	R1511	3.9k				
R1202	10	R1512	220				
R1203	10	R1513	0				
R1204	1k	R1514	1k				
R1205	10k	R1515	1k				
R1206	10k	R1516					
R1207	4.7k	R1517	51				
R1208	8.2k	R1518	1k				
R1209	100	R1519	1k				
R1210	0	R1520	1k				
R1211	0	R1801	1				
R1212	0	R1802	1				
R1220	10k	R1805	1				
R1281	1k	R1806	1				
R1282	1k	R1810	0				
R1283	1k						
R1284	1k						
R1285	1k						
R1286	1k						
R1287	1k						
R1288	1k						
R1301	1k						
R1302	1k						
R1304	0						
R1305	0						
R1306	10k						
R1307	0						
R1308	12k						
R1309	1k						
R1310	6.2k						
R1311	10k						
R1312	10k						
R1320	0						
R1322	47						
R1331	0						
R1400	10k						
R1401	0						

R1406	150						
R1408	0						
R1409	1k						
R1410	0						
R1411	56						
R1412	56						
R1413	56k						
R1414	1k						
R1415	3.9k						
R1416	10k						
R1417	1.8k						
R1418	22k						

SCP-5000 Parts List

Reference No.	Function	Part No.
	PLL Synthesizer	
IC 151	PLL IC	MB15F73SP
X1502	PCS/AMPS VCO	YK509MDB097M1750B
Q1502	Transister	HN7G03FU
	Transmitter	
IC143	PCS Power Amplifier	RF2153
X144	AMPS Power Amplifie	PA3100 2
IC141	Switch	uPG158TB
IC142	Invert IC	TC7SU04FU
IC162	Temp Sens.	LM20M7X
Q1401,1402	Transister	HN7G03FU
D1401,1402	Diode	HSC88
X101	Diplexer	LFDP15N0039A
XF102	PCS Duplexer	DFYK1R88C1R96HHJ
XF103	AMPS Duplexer	EFSD836MB1Z1
XF143	PCS Isolator	CE0421R88DCB
XF146	AMPS Isolator	CE053R836DCA
XF141	PCS SAW Filter	SAFC1867.5T1897.5ML1DOT
XF144	AMPS SAW Filter	SRF836NJC31
XF142	PCS Coupler	LDC10B190J1880
XF145	AMPS Coupler	LDC10B150J0836
	Regulator	
IC181, 182	Regulator(3.0V/3.0V)	R5321D003A
IC183	Regulator(2.9V)	R1121N291B
	Receiver	
IC113	LNA/Mixer	RFR3100
IC112	PCS LNA	NE34018
IC111	AMPS LNA	GN01096B
IC114		TC7SU04FU
Q1101,1102	Transister	HN7G03FU
XF112	PCS RF SAW Filter	M196NW2BP_KF00541
XF111	AMPS RF SAW Filter	SAFC881.5MF1A0T
X114	PCS IF SAW Filter	B4910
XF113	AMPS IF SAW Filter	SAFC85.380MA15X
	IF AGC Circuit	
IC131	TX AGC+Mixer IC	RFT3100
IC121	RX AGC IC	IFR3000
Q1201,1301	Transistor	DTC144EE
D1202,1203,1301,13	Diode	HVC202A
Q1202,1302	Diode	DAN235E
	TCXO Circuit	
X1501	TCXO	KT18-ECV30A-19.680M
Q1501	Transistor	2SC4649

Tentative Specification of ISOLATOR

Tentative SPEC No.	: NCE64-P0822A
Part Number	: CE0401G88DCB000TT1
Old Part Number	: CE0401R88DCB

Written by M. Kawashima
Checked by Y. Ohtani
Date 19/ Apr./ '00

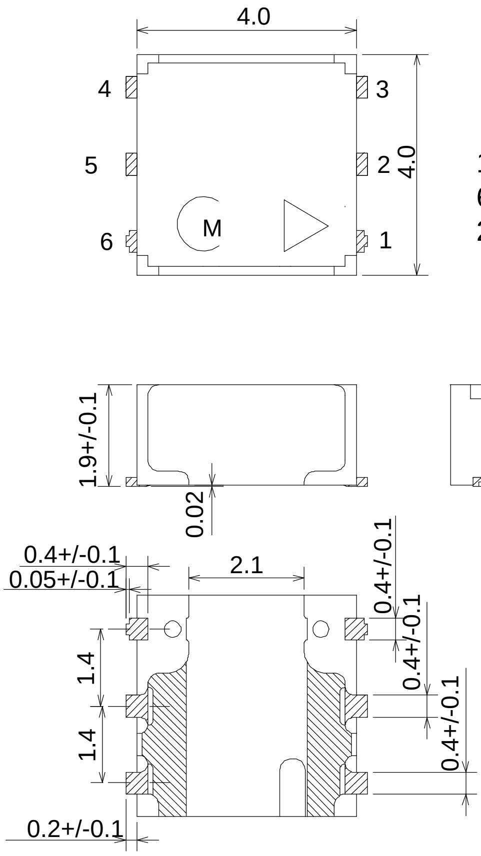
A>: Revised by MK on May/19/'00

1. Electrical

Frequency Range	1850~1910 MHz	
Operating Temp.	-35~+85°C	+20~+30°C
Insertion Loss	0.6 dB max.	A> 0.5 dB max.
Isolation	14 dB min.	A> 15 dB min.
VSWR Forward Reverse	 1.6 max. 1.6 max.	 --- max. --- max.
Rating Power	2.5 W max.	
Reflection Power	0.6 W max.	
Impedance	50 Ω	
Attenuation Absolute value	A> (*) 3700~3820MHz 10 dB min. (*) 5550~5730MHz 15dB min.	

Note1: Case surface temperature should be less than 100°C under the operation.
2: The specifications and dimensions in this spec. may be subject to change without notice.
3: (*) will not be measured in regular production. This value always meets the specification.

2: Mechanical (Figure, Circuit, Port)



1 : OUT
6 : IN
2,3,4,5 : GROUND

TOLERANCES UNLESS
OTHERWISE SPECIFIED : +/-0.2
DIMENSIONS : mm

I/O,GND Terminal
Solder resist

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Standard

Preliminary Specification of ISOLATOR		Written by	Y.Nakamura
Preliminary SPEC No.	:NCE64-P0637G	Checked by	K.Matsunaga
Part Number	:CE0521R88DCB	Date	25/ Feb/ '97

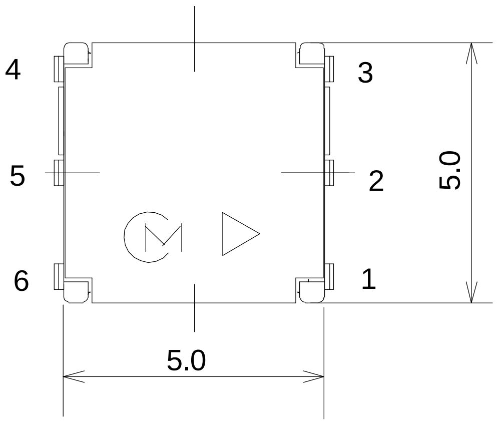
A>:Rev. by T.Y. on 28/Oct./'97
B>:Rev. by M.K. on 7/Jan./'98
C>:Rev. by T.J. on 28/Jan./'98
D>:Rev. by T.J. on 9/Feb./'98
E>:Rev. by T.J. on 13/Feb./'98
F>:Rev. by T.J. on 23/Mar./'98
G>:Rev. by T.Y. on 21/Jun./'99

1. Electrical

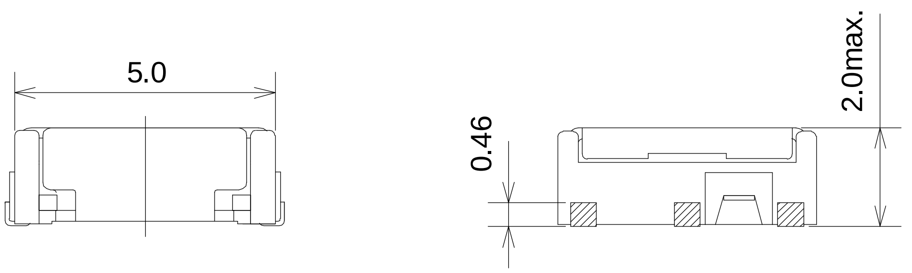
Frequency Range	1850~1910 MHz	
Operating Temp.	-35~+85°C	+20~+30°C
Insertion Loss	0.6 dB max.	--- dB max.
Isolation	B> 14 dB min.	B> 15 dB min.
VSWR Forward Reverse	 1.6 max. 1.6 max.	 --- max. --- max.
Rating Power	2.5 W max.	
Reflection Power	0.6 W max.	
Impedance	50 Ω	
Attenuation Absolute value	F>C>(*) 3700~3820MHz 3 dB min.(-35~+85°C) C> (*) 5550~5730MHz 10 dB min.(-35~+85°C)	

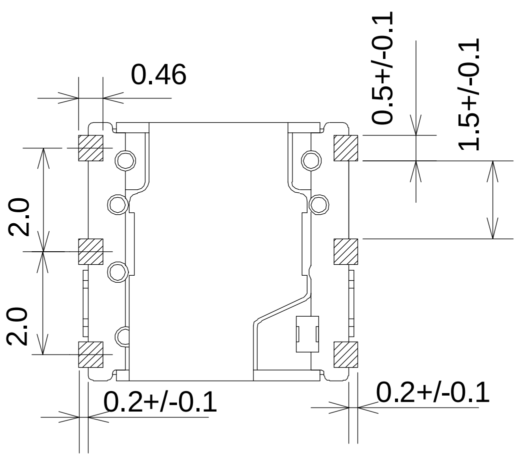
Note1: Case surface temperature should be less than 100°C under the operation.
C> Note2: (*) will not be measured in regular production. This value always meets the specification.

2. Mechanical (Figure, Circuit, Port)
A>D>E>G>



1 : OUT
6 : IN
2,3,4,5 : GROUND





TOLERANCES UNLESS
OTHERWISE SPECIFIED : +/-0.2
DIMENSIONS : mm

MURATA MFG. CO., LTD.

Preliminary Specification of ISOLATOR

Preliminary SPEC No. :NCE64-P0768D

Part Number :CE053R836DCA

Written by M.Kawashima

Checked by K.Matsunaga

Date 24/ Dec./ '98

A>: Rev. by T.Y. on 20/Jan./'99
B>: Rev. by M.K on 22/Feb/'99
C>: Rev. by T.Y. on 16/Mar./'99
D>: Rev. by T.Y. on 10/May./'99

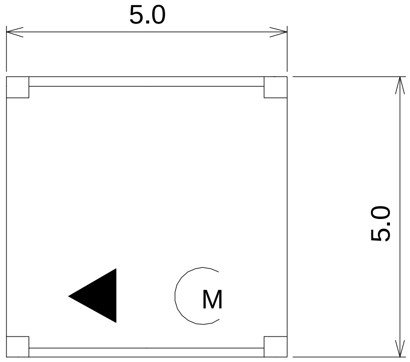
1. Electrical

Frequency Range	824~849 MHz	
Operating Temp.	-35~+85°C	+20~+30°C
Insertion Loss	0.65 dB max.	0.55 dB max.
Isolation	13 dB min.	15 dB min.
VSWR Forward Reverse	 1.5 max. 1.5 max.	 --- max. --- max.
Rating Power	2.5 W max.	
Reflection Power	0.6 W max.	
Impedance	50 Ω	
Attenuation Absolute value	(*) 1648~1698MHz 15 dB min. B> (*) 2472~2547MHz 20 dB min.	

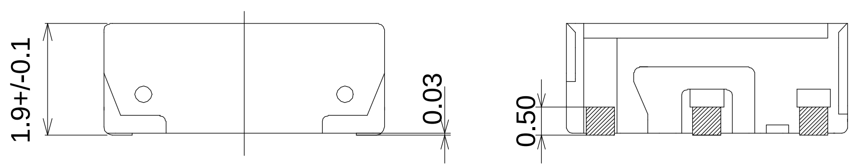
Note1 : Case surface temperature should be less than 100°C under the operation.
2 : The specifications and dimensions in this spec. may be subject to change without notice.
3 : (*) will not be measured in regular production. This value always meets the specification.

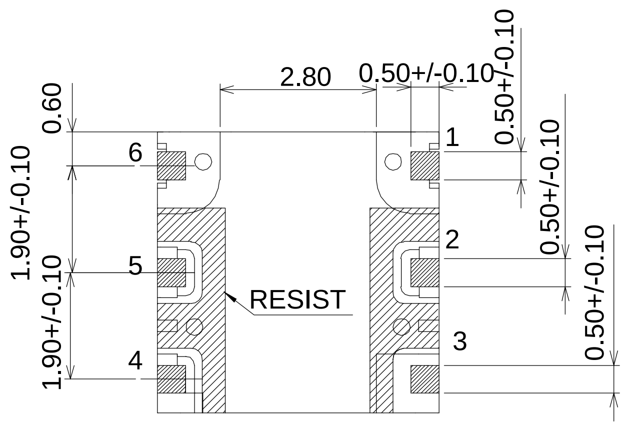
2: Mechanical(Figure, Circuit, Port)

A>C>D>



1 : IN
6 : OUT
2,3,4,5 : GROUND





TOLERANCES UNLESS
OTHERWISE SPECIFIED : +/-0.2
DIMENSIONS : mm

MURATA MFG. CO., LTD.

Preliminary Specification of GIGAFIL®	
Preliminary SPEC No.	: NBF61-P4250
Part Number	: DFYK1R88C1R96HHJB

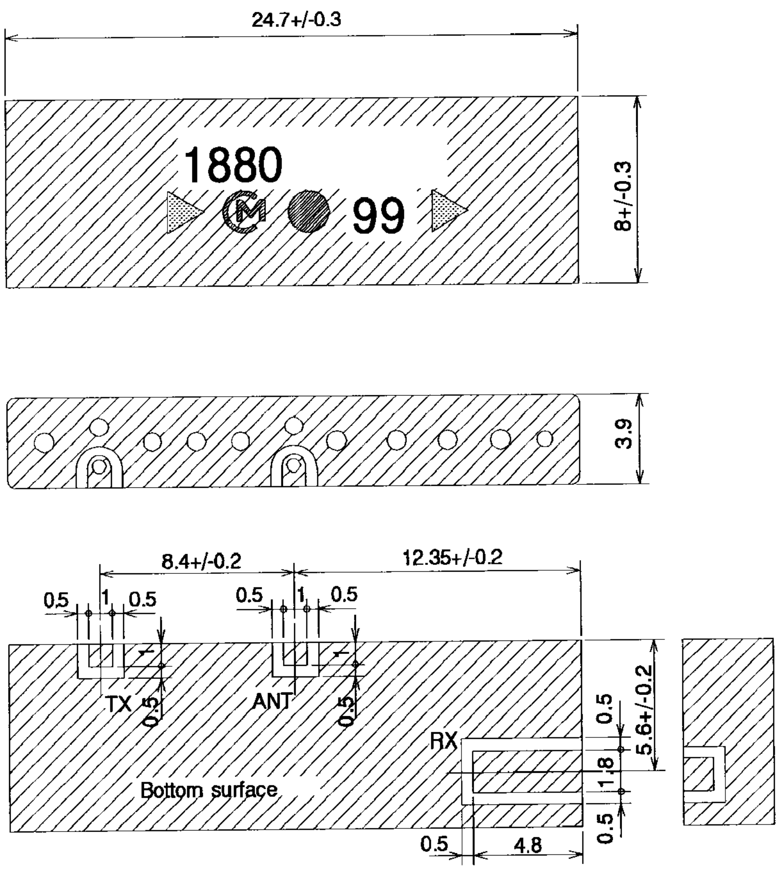
Written by	T.Yamamoto
Checked by	Y.Ohtani
Date	8/Feb./2000

A>:

1. Electrical

	TX→ANT	ANT→RX
Center Frequency	FT : 1880.0 MHz	FR : 1960.0 MHz
Poles	BPF3+BEF1	BPF5
Band Width (BW)	FT ± 30.0 MHz	FR ± 30.0 MHz
IL at BW 0~+35°C -30~+85°C	 3.0 dB max. 3.4 dB max.	 4.0 dB max 4.1 dB max.
Ripple at BW	2.6 dB max.	3.0 dB max.
VSWR at BW	1.8 max.	2.0 max.
Group Delay at BW	-- nsec max.	-- nsec max.
Input Power	1.0 W max.	1.0 W max.
Attenuation Absolute value	1930~1990MHz 40 dB min.	(0~+35°C)1850~1910MHz 50dB min. (-30~+85°C)1850~1910MHz 48dB min

2. Mechanical (Figure, Circuit, Port)



TOLERANCES UNLESS
OTHERWISE SPECIFIED : +/-0.1
DIMENSIONS : mm

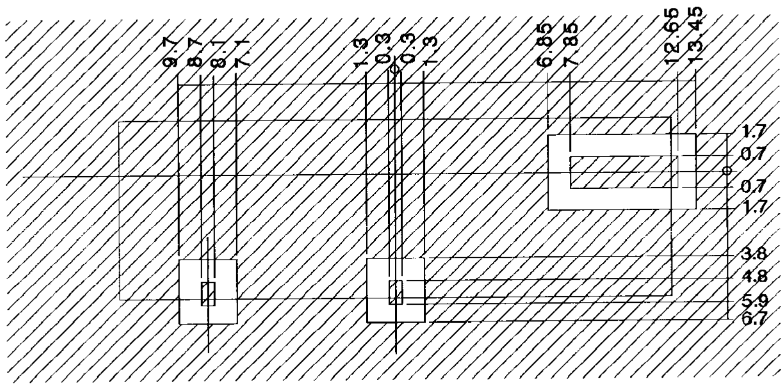
The ANT, TX and RX pad size may be changed without notice.

Written by T.Yamamoto
Checked by Y.Ohtani
Date 8/Feb./2000

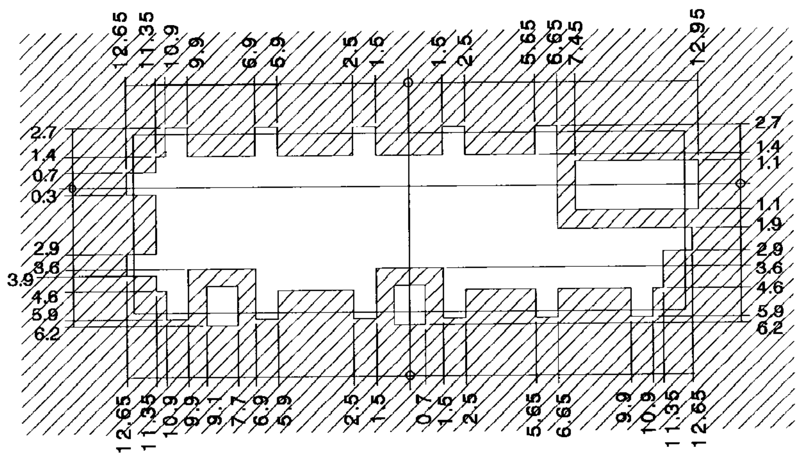
3. Recommended Land Pattern

Note : Impedance of signal lines should be 50 ohms including land pattern. The standard condition is applying the glass epoxy board (t = 1.0 mm, dielectric constant = 4.8, copper plating on both surfaces) and the land patterns are connected to 50 ohms micro-strip lines on back side surface through the via hole.

Electrode



Solder Resist



The Electrode and solder resist pattern may be changed without notice.

MURATA MFG. CO., LTD.

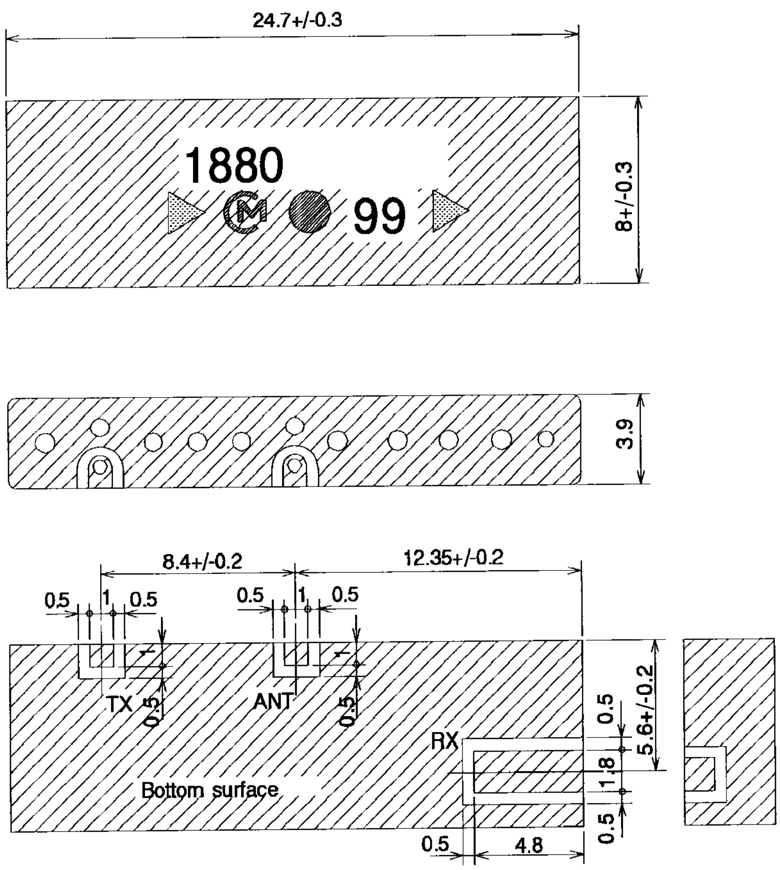
Preliminary Specification of GIGAFIL®	Written by T.Yamamoto
Preliminary SPEC No. : NBF61-P4250	Checked by Y.Ohtani
Part Number : DFYK1R88C1R96HHJB	Date 8/Teb./2000

A>:

1. Electrical

	TX→ANT	ANT→RX
Center Frequency	FT : 1880.0 MHz	FR : 1960.0 MHz
Poles	BPF3+BEF1	BPF5
Band Width (BW)	FT ± 30.0 MHz	FR ± 30.0 MHz
IL at BW 0~+35°C -30~+85°C	 3.0 dB max. 3.4 dB max.	 4.0 dB max 4.1 dB max.
Ripple at BW	2.6 dB max.	3.0 dB max.
VSWR at BW	1.8 max.	2.0 max.
Group Delay at BW	-- nsec max.	-- nsec max.
Input Power	1.0 W max.	1.0 W max.
Attenuation Absolute value	1930~1990MHz 40 dB min.	(0~+35°C)1850~1910MHz 50dB min. (-30~+85°C)1850~1910MHz 48dB min

2. Mechanical (Figure, Circuit, Port)



TOLERANCES UNLESS
OTHERWISE SPECIFIED : +/-0.1
DIMENSIONS : mm

The ANT, TX and RX pad size may be changed without notice.

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MURATA MFG. CO., LTD.

Preliminary Specification of GIGAFIL®

Preliminary SPEC No. : NBF61-P4250

Part Number : DFYK1R88C1R96HHJB

Written by T.Yamamoto

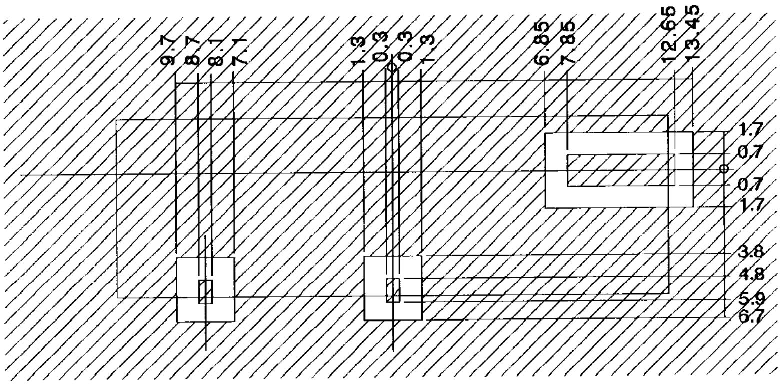
Checked by Y.Ohtani

Date 8/Feb./2000

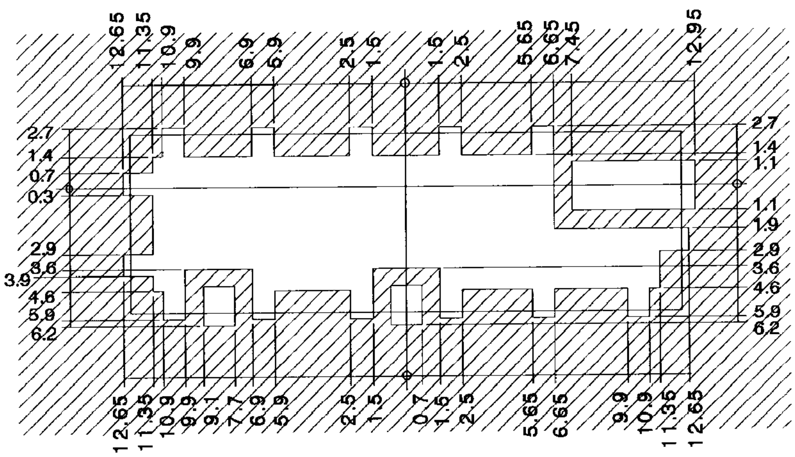
3. Recommended Land Pattern

Note : Impedance of signal lines should be 50 ohms including land pattern. The standard condition is applying the glass epoxy board (t = 1.0 mm, dielectric constant = 4.8, copper plating on both surfaces) and the land patterns are connected to 50 ohms micro-strip lines on back side surface through the via hole.

Electrode



Solder Resist



The Electrode and solder resist pattern may be changed without notice.

TOSHIBA MULTI CHIP DISCRET DEVICE

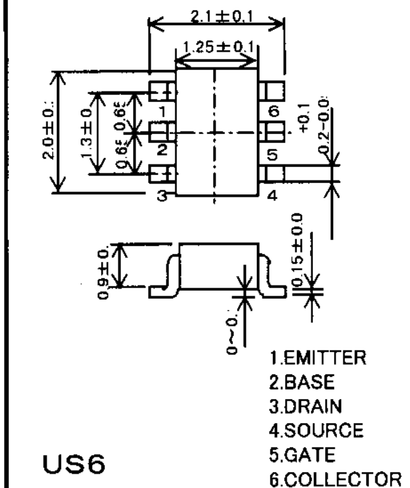
HN7G03FU

POWER MANAGEMENT SWITCH APPLICATION
DRIVER CIRCUIT APPLICATION
INTERFACE CIRCUIT APPLICATION

Q1(transistor) : 2SA1955 Equivalent

Q2(S-MOS) : SSM3K04FS Equivalent

Unite in mm



JEDEC	—
EIAJ	—
TOSHIBA	—

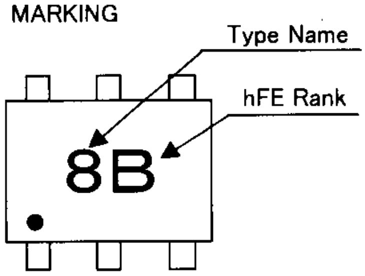
Q1 (Transistor) MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Collector−Base Voltage	V_{CBO}	−15	V
Collector−Emitter Voltage	V_{CEO}	−12	V
Emitter−Base Voltage	V_{EBO}	−5	V
Collector Current	I_C	−400	mA
Base Current	I_B	−50	mA

Q2 (S−MOS) MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain−Aource Voltage	V_{DS}	20	V
Gate−Source Voltage	V_{GSS}	10	V
Drain Current	I_D	100	mA

MARKING

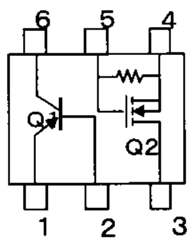


Q1,Q2 COMMON RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Dissipation	P_C (※)	200	mW
Junction Temperture	T_j	125	°C
Storage Temperature Range	T_{stg}	−55~125	°C

(※) Total Rating

Equivarent Circuit(TOP VIEW)



Q1 (Transistor) ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB}=−15V, I_E=0	—	—	−0.1	μA
Emitter Cut-off Current	I_{EBO}	V_{EB}=−5V, I_C=0	—	—	−0.1	μA
DC Current Gain	h_{FE} ※	V_{CE}=−2V, I_C=−10mA	300	—	1000	
Collector-Emitter Saturation Voltage	$V_{CE(sat)\ (1)}$	I_C=−10mA, I_B=−0.5mA	—	−15	−30	mV
	$V_{CE(sat)\ (2)}$	I_C=−200mA, I_B=−10mA	—	−110	−250	mV
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	I_C=−200mA, I_B=−10mA	—	−0.87	−1.2	V

※ : hFE Classification A: 300～600, B: 500～1000

Q1 (S-MOS) ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Curreent	I_{GSS}	V_{GS}=10V, V_{DS}=0	—	—	15	μA
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=100μA, V_{GS}=0	20	—	—	V
Drain Current	I_{DSS}	V_{DS}=20V, V_{GS}=0	—	—	1	μA
Gate Threshold Voltage	V_{th}	V_{DS}=3V, I_D=0.1mA	0.7	—	1.3	V
Forward Transfer Admittance	$\|Y_{fs}\|$	V_{DS}=3V, I_D=10mA	25	50	—	mS
Drain-Souce ON Resistance	$R_{DS(ON)}$	I_D=10mA, V_{GS}=2.5V	—	4	12	Ω

HSC88

Silicon Schottky Barrier Diode for Various Detector, Mixer

HITACHI

ADE-208-826 (Z)
Rev 0
Nov. 1999

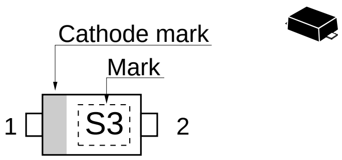
Features

- Low capacitance. (C = 0.8pF max)
- Low forward voltage.
- Ultra small Flat Package (UFP) is suitablefor high density surface mounting and high speed assembly.

Ordering Information

Type No.	Laser Mark	Package Code
HSC88	S3	UFP

Outline



1. Cathode
2. Anode

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Value	Unit
Reverse voltage	V_R	10	V
Average rectified current	I_O	15	mA
Junction temperature	Tj	125	°C
Storage temperature	Tstg	-55 to +125	°C

Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Forward voltage	V_{F1}	350	—	420	mV	I_F = 1 mA
	V_{F2}	500	—	580		I_F = 10 mA
Reverse current	I_{R1}	—	—	0.2	µA	V_R = 2V
	I_{R2}	—	—	10		V_R = 10V
Capacitance	C	—	—	0.8	pF	V_R = 0V, f = 1 MHz
ESD-Capability*1	—	30	—	—	V	C = 200pF , Both forward and reverse direction 1 pulse.

Notes 1. Failure criterion ; $I_R \geq$ 400nA at V_R =2 V

Main Characteristic

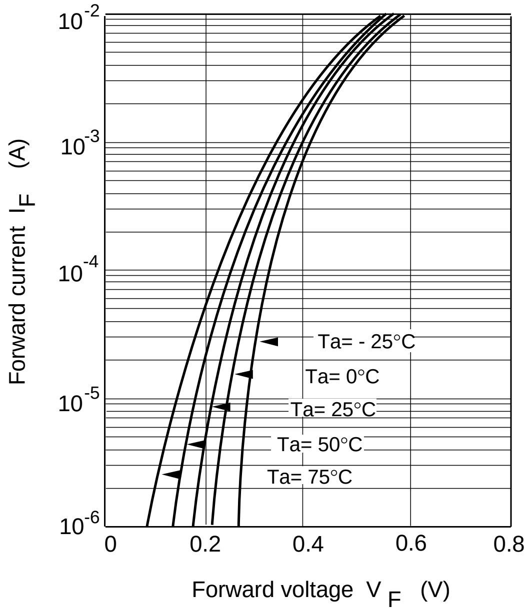


Fig.1 Forward current Vs. Forward voltage

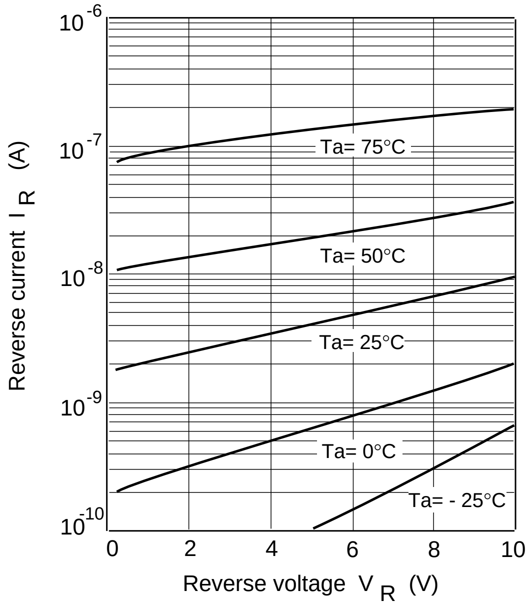


Fig.2 Reverse current Vs. Reverse voltage

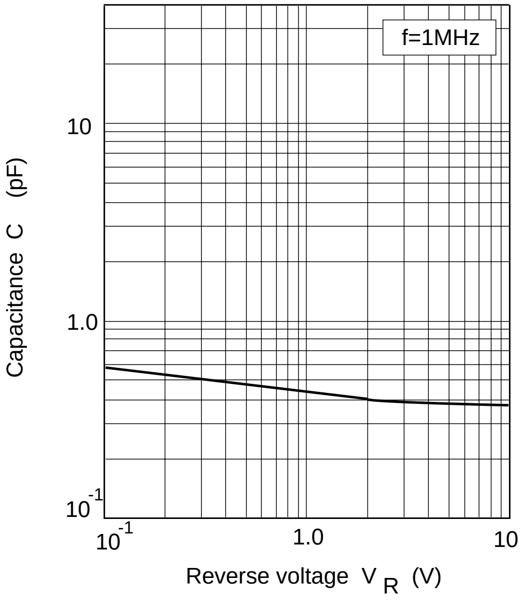
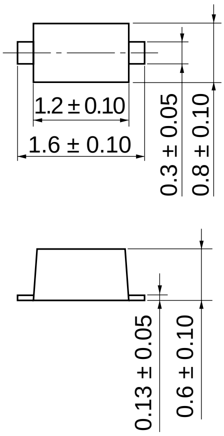


Fig.3 Capacitance Vs. Reverse voltage

Package Dimensions

Unit: mm



Hitachi Code	UFP
JEDEC	—
EIAJ	Conforms
Mass	0.0016 g

Cautions

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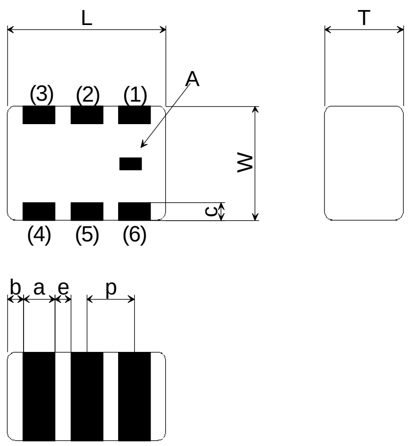
Telex: 40815 HITEC HX

DIRECTIONAL COUPLER (Preliminary)

1. Characteristics (at -40 to +85°C)

Part Number	LDC10B150J0836
Frequency Range (BW)	836.50 ± 12.50 MHz
Coupling	15.90 ± 1.00 dB (Termination : 50 Ω)
Insertion Loss in BW	0.30 dB max. at 25 °C 0.33 dB max. at -40 to +85 °C
Isolation	24.0 dB min.
V.S.W.R. in BW	1.40 max.
Characteristics Impedance	50 Ω (Nominal)
Power Capacity	3.0 W max. (50 Ω Load)

2. Construction,Dimensions&Marking



(in mm)

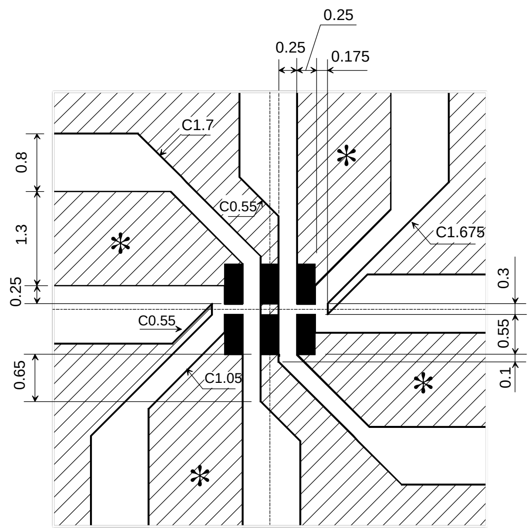
Mark	Meaning
A	Directional Input Mark

Mark	Dimension	Mark	Dimension
L	1.6±0.1	b	0.20+0.10/-0.15
W	0.8±0.1	c	0.15±0.1
T	0.6±0.1	e	0.3±0.1
a	0.2±0.1	p	0.50±0.05

TERMINAL CONFIGURATION

Terminal No.	Terminal Name	Terminal No.	Terminal Name
(1)	IN	(4)	Terminate
(2)	GND	(5)	GND
(3)	Coupled OUT	(6)	Main OUT

3. Land Pattern



(in mm)

Land

Solder resist

No pattern
Solder resist

* Line width to be designed to match 50Ω characteristic impedance, depending on PCB material and thickness.

All the technical data and information contained herein are subject to change without prior notice.

National Semiconductor

July 2000

LM20
2.4V, 10µA, SC70, micro SMD Temperature Sensor

General Description

The LM20 is a precision analog output CMOS integrated-circuit temperature sensor that operates over a −55˚C to +130˚C temperature range. The power supply operating range is +2.4 V to +5.5 V. The transfer function of LM20 is predominately linear, yet has a slight predictable parabolic curvature. The accuracy of the LM20 when specified to a parabolic transfer function is ±1.5˚C at an ambient temperature of +30˚C. The temperature error increases linearly and reaches a maximum of ±2.5˚C at the temperature range extremes. The temperature range is affected by the power supply voltage. At a power supply voltage of 2.7 V to 5.5 V the temperature range extremes are +130˚C and −55˚C. Decreasing the power supply voltage to 2.4 V changes the negative extreme to −30˚C, while the positive remains at +130˚C.

The LM20's quiescent current is less than 10 µA. Therefore, self-heating is less than 0.02˚C in still air. Shutdown capability for the LM20 is intrinsic because its inherent low power consumption allows it to be powered directly from the output of many logic gates or does not necessitate shutdown at all.

Applications

- Cellular Phones
- Computers
- Power Supply Modules
- Battery Management
- FAX Machines
- Printers
- HVAC
- Disk Drives
- Appliances

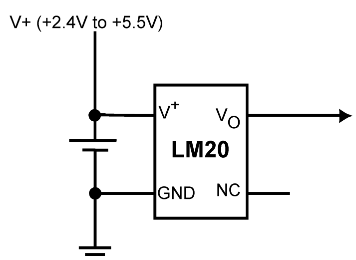
Features

- Rated for full −55˚C to +130˚C range
- Available in an SC70 and a micro SMD package
- Predictable curvature error
- Suitable for remote applications

Key Specifications

□ Accuracy at +30˚C	±1.5 to ±4 ˚C (max)
□ Accuracy at +130˚C & −55˚C	±2.5 to ±5 ˚C (max)
□ Power Supply Voltage Range	+2.4V to +5.5V
□ Current Drain	10 µA (max)
□ Nonlinearity	±0.4 % (typ)
□ Output Impedance	160 Ω (max)
□ Load Regulation $0\ \mu A < I_L < +16\ \mu A$	−2.5 mV (max)

Typical Application



DS100908-2

$$V_O = (-3.88 \times 10^{-6} \times T^2) + (-1.15 \times 10^{-2} \times T) + 1.8639$$

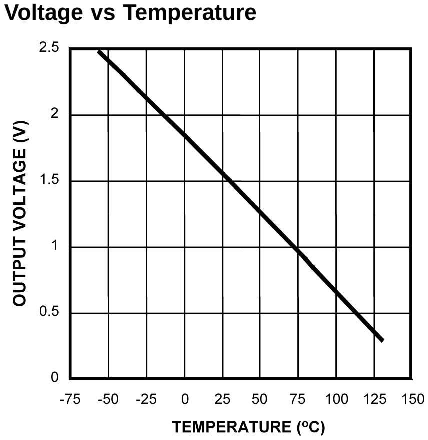
or

$$T = -1481.96 + \sqrt{2.1962 \times 10^6 + \frac{(1.8639 - V_O)}{3.88 \times 10^{-6}}}$$

where:

T is temperature, and V_O is the measured output voltage of the LM20.

Output Voltage vs Temperature



DS100908-24

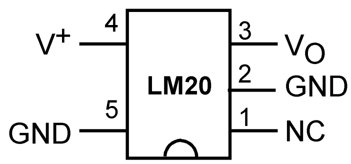
Full-Range Celsius (Centigrade) Temperature Sensor (−55˚C to +130˚C)
Operating from a Single Li-Ion Battery Cell

Typical Application (Continued)

Temperature (T)	Typical V_O
+130˚C	+303 mV
+100˚C	+675 mV
+80˚C	+919 mV
+30˚C	+1515 mV
+25˚C	+1574 mV
0˚C	+1863.9 mV
−30˚C	+2205 mV
−40˚C	+2318 mV
−55˚C	+2485 mV

Connection Diagrams

SC70-5



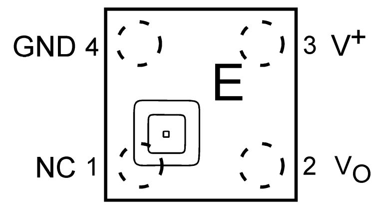
DS100908-1

Note:

- GND (pin 2) may be grounded or left floating. For optimum thermal conductivity to the pc board ground plane pin 2 should be grounded.
- NC (pin 1) should be left floating or grounded. Other signal traces should not be connected to this pin.

Top View
See NS Package Number MAA05A

micro SMD



DS100908-32

Note:

- Pin numbers are referenced to the package marking text orientation.
- Reference JEDEC Registration MO-211, variation BA
- The actual physical placement of package marking will vary slightly from part to part. The package marking will designate the date code and will vary considerably. Package marking does not correlate to device type in any way.

Top View
See NS Package Number BPA04DDC

Ordering Information

Order Number	Temperature Accuracy	Temperature Range	NS Package Number	Device Marking	Transport Media
LM20BIM7	±2.5˚C	−55˚C to +130˚C	MAA05A	T2B	1000 Units on Tape and Reel
LM20BIM7X	±2.5˚C	−55˚C to +130˚C	MAA05A	T2B	3000 Units on Tape and Reel
LM20CIM7	±5˚C	−55˚C to +130˚C	MAA05A	T2C	1000 Units on Tape and Reel
LM20CIM7X	±5˚C	−55˚C to +130˚C	MAA05A	T2C	3000 Units on Tape and Reel
LM20SIBP	±3.5˚C	−40˚C to +125˚C	BPA04DDC	Date Code	250 Units on Tape and Reel
LM20SIBPX	±3.5˚C	−40˚C to +125˚C	BPA04DDC	Date Code	3000 Units on Tape and Reel

Absolute Maximum Ratings (Note 1)

Supply Voltage	+6.5V to −0.2V
Output Voltage	(V^+ + 0.6 V) to −0.6 V
Output Current	10 mA
Input Current at any pin (Note 2)	5 mA
Storage Temperature	−65˚C to +150˚C
Maximum Junction Temperature (T_{JMAX})	+150˚C
ESD Susceptibility (Note 3) :	
Human Body Model	2500 V
Machine Model	250 V
Lead Temperature	
SC-70 Package (Note 4) :	
Vapor Phase (60 seconds)	+215˚C
Infrared (15 seconds)	+220˚C

Operating Ratings (Note 1)

Specified Temperature Range:	$T_{MIN} \le T_A \le T_{MAX}$
LM20B, LM20C with 2.4 V ≤ V^+≤ 2.7 V	−30˚C ≤ T_A ≤ +130˚C
LM20B, LM20C with 2.7 V ≤ V^+≤ 5.5 V	−55˚C ≤ T_A ≤ +130˚C
LM20S with 2.4 V ≤ V^+≤ 5.5 V	−30˚C ≤ T_A ≤ +125˚C
LM20S with 2.7 V ≤ V^+≤ 5.5 V	−40˚C ≤ T_A ≤ +125˚C
Supply Voltage Range (V^+)	+2.4 V to +5.5 V
Thermal Resistance, θ_{JA}(Note 5)	
SC-70	415˚C/W
micro SMD	340˚C/W

Electrical Characteristics

Unless otherwise noted, these specifications apply for V^+ = +2.7 V_{DC}. **Boldface limits apply for $T_A = T_J = T_{MIN}$ to T_{MAX}** ; all other limits $T_A = T_J$ = 25˚C; Unless otherwise noted.

Parameter	Conditions	Typical (Note 6)	LM20B Limits (Note 7)	LM20C Limits (Note 7)	LM20S Limits (Note 7)	Units (Limit)
Temperature to Voltage Error $V_O = (-3.88\text{x}10^{-6}\text{x}T^2) + (-1.15\text{x}10^{-2}\text{x}T) + 1.8639V$ (Note 8)	T_A = +25˚C to +30˚C		±1.5	±4.0	±2.5	˚C (max)
	T_A = +130˚C		**±2.5**	**±5.0**		˚C (max)
	T_A = +125˚C		**±2.5**	**±5.0**	**±3.5**	˚C (max)
	T_A = +100˚C		**±2.2**	**±4.7**	**±3.2**	˚C (max)
	T_A = +85˚C		**±2.1**	**±4.6**	**±3.1**	˚C (max)
	T_A = +80˚C		**±2.0**	**±4.5**	**±3.0**	˚C (max)
	T_A = 0˚C		**±1.9**	**±4.4**	**±2.9**	˚C (max)
	T_A = −30˚C		**±2.2**	**±4.7**	**±3.3**	˚C (min)
	T_A = −40˚C		**±2.3**	**±4.8**	**±3.5**	˚C (max)
	T_A = −55˚C		**±2.5**	**±5.0**		˚C (max)
Output Voltage at 0˚C		+1.8639				V
Variance from Curve		±1.0				˚C
Non-Linearity (Note 9)	−20˚C ≤ T_A ≤ +80˚C	±0.4				%
Sensor Gain (Temperature Sensitivity or Average Slope) to equation: V_O=−11.77 mV/˚CxT+1.860V	−30˚C ≤ T_A ≤ +100˚C	−11.77	**−11.4** **−12.2**	**−11.0** **−12.6**	**−11.0** **−12.6**	mV/˚C (min) mV/˚C (max)
Output Impedance	0 µA ≤ I_L ≤ +16 µA(Notes 11, 12)		**160**	**160**	**160**	Ω (max)
Load Regulation(Note 10)	0 µA ≤ I_L ≤ +16 µA(Notes 11, 12)		**−2.5**	**−2.5**	**−2.5**	mV (max)
Line Regulation	+2. 4 V ≤ V^+ ≤ +5.0V		**+3.3**	**+3.7**	**+3.7**	mV/V (max)
	+5.0 V ≤ V^+ ≤ +5.5 V		**+8.8**	**+8.9**	**+8.9**	mV (max)
Quiescent Current	+2. 4 V ≤ V^+ ≤ +5.5V	4.5	7	7	7	µA (max)
	+2. 4 V ≤ V^+ ≤ +5.0V	4.5	**10**	**10**	**10**	µA (max)
Change of Quiescent Current	+2. 4 V ≤ V^+ ≤ +5.5V	+0.7				µA
Temperature Coefficient of Quiescent Current		−11				nA/˚C
Shutdown Current	V^+ ≤ +0.8 V	0.02				µA

Electrical Characteristics (Continued)

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Note 2: When the input voltage (V_I) at any pin exceeds power supplies (V_I < GND or V_I > V^+), the current at that pin should be limited to 5 mA.

Note 3: The human body model is a 100 pF capacitor discharged through a 1.5 kΩ resistor into each pin. The machine model is a 200 pF capacitor discharged directly into each pin.

Note 4: See AN-450 “Surface Mounting Methods and Their Effect on Product Reliability” or the section titled “Surface Mount” found in any post 1986 National Semiconductor Linear Data Book for other methods of soldering surface mount devices.

Note 5: The junction to ambient thermal resistance (θ_{JA}) is specified without a heat sink in still air using the printed circuit board layout shown in *Figure *NO TARGET FOR fig NS1382**.

Note 6: Typicals are at $T_J = T_A = 25^\circ C$ and represent most likely parametric norm.

Note 7: Limits are guaranteed to National’s AOQL (Average Outgoing Quality Level).

Note 8: Accuracy is defined as the error between the measured and calculated output voltage at the specified conditions of voltage, current, and temperature (expressed in˚C).

Note 9: Non-Linearity is defined as the deviation of the calculated output-voltage-versus-temperature curve from the best-fit straight line, over the temperature range specified.

Note 10: Regulation is measured at constant junction temperature, using pulse testing with a low duty cycle. Changes in output due to heating effects can be computed by multiplying the internal dissipation by the thermal resistance.

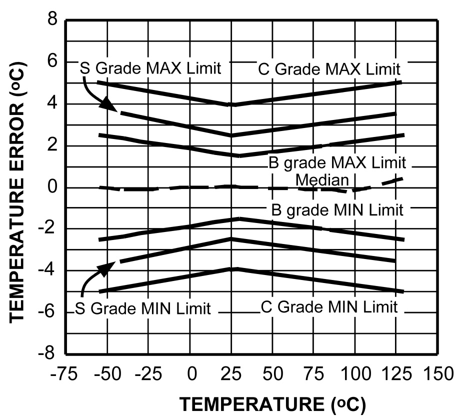
Note 11: Negative currents are flowing into the LM20. Positive currents are flowing out of the LM20. Using this convention the LM20 can at most sink −1 µA and source +16 µA.

Note 12: Load regulation or output impedance specifications apply over the supply voltage range of +2.4V to +5.5V.

Note 13: Line regulation is calculated by subtracting the output voltage at the highest supply input voltage from the output voltage at the lowest supply input voltage.

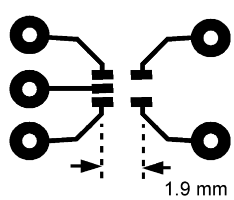
Typical Performance Characteristics

Temperature Error vs Temperature



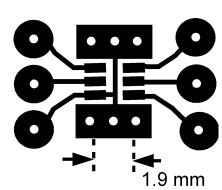
DS100908-25

PCB Layouts Used for Thermal Measurements



DS100908-29

a) Layout used for no heat sink measurements.



DS100908-30

b) Layout used for measurements with small heat hink.

FIGURE 1. PCB Lyouts used for thermal measurements.

1.0 LM20 Transfer Function

The LM20's transfer function can be described in different ways with varying levels of precision. A simple linear transfer function, with good accuracy near 25˚C, is

$$V_O = -11.69\ mV/^\circ C \times T + 1.8663\ V$$

Over the full operating temperature range of −55˚C to +130˚C, best accuracy can be obtained by using the parabolic transfer function

$$V_O = (-3.88 \times 10^{-6} \times T^2) + (-1.15 \times 10^{-2} \times T) + 1.8639$$

solving for T:

$$T = -1481.96 + \sqrt{2.1962 \times 10^6 + \frac{(1.8639 - V_O)}{3.88 \times 10^{-6}}}$$

A linear transfer function can be used over a limited temperature range by calculating a slope and offset that give best results over that range. A linear transfer function can be calculated from the parabolic transfer function of the LM20. The slope of the linear transfer function can be calculated using the following equation:

$$m = -7.76 \times 10^{-6} \times T - 0.0115,$$

where T is the middle of the temperature range of interest and m is in V/˚C. For example for the temperature range of T_{min}=−30 to T_{max}=+100˚C:

$$T = 35^\circ C$$

and

$$m = -11.77\ mV/^\circ C$$

The offset of the linear transfer function can be calculated using the following equation:

$$b = (V_{OP}(T_{max}) + V_{OP}(T) + m \times (T_{max} + T))/2,$$

where:

- $V_{OP}(T_{max})$ is the calculated output voltage at T_{max} using the parabolic transfer function for V_O
- $V_{OP}(T)$ is the calculated output voltage at T using the parabolic transfer function for V_O.

Using this procedure the best fit linear transfer function for many popular temperature ranges was calculated in *Figure 2*. As shown in *Figure 2* the error that is introduced by the linear transfer function increases with wider temperature ranges.

Temperature Range		Linear Equation V_O=	Maximum Deviation of Linear Equation from Parabolic Equation (˚C)
T_{min} (˚C)	T_{max} (˚C)		
−55	+130	−11.79 mV/˚C x T + 1.8528 V	±1.41
−40	+110	−11.77 mV/˚C x T + 1.8577 V	±0.93
−30	+100	−11.77 mV/˚C x T + 1.8605 V	±0.70
-40	+85	−11.67 mV/˚C x T + 1.8583 V	±0.65
−10	+65	−11.71 mV/˚C x T + 1.8641 V	±0.23
+35	+45	−11.81 mV/˚C x T + 1.8701 V	±0.004
+20	+30	−11.69 mV/˚C x T + 1.8663 V	±0.004

FIGURE 2. First order equations optimized for different temperature ranges.

2.0 Mounting

The LM20 can be applied easily in the same way as other integrated-circuit temperature sensors. It can be glued or cemented to a surface. The temperature that the LM20 is sensing will be within about +0.02˚C of the surface temperature to which the LM20's leads are attached to.

This presumes that the ambient air temperature is almost the same as the surface temperature; if the air temperature were much higher or lower than the surface temperature, the actual temperature measured would be at an intermediate temperature between the surface temperature and the air temperature.

To ensure good thermal conductivity the backside of the LM20 die is directly attached to the pin 2 GND pin. The tempertures of the lands and traces to the other leads of the LM20 will also affect the temperature that is being sensed.

Alternatively, the LM20 can be mounted inside a sealed-end metal tube, and can then be dipped into a bath or screwed into a threaded hole in a tank. As with any IC, the LM20 and accompanying wiring and circuits must be kept insulated and dry, to avoid leakage and corrosion. This is especially true if the circuit may operate at cold temperatures where condensation can occur. Printed-circuit coatings and varnishes such as Humiseal and epoxy paints or dips are often used to ensure that moisture cannot corrode the LM20 or its connections.

The thermal resistance junction to ambient (θ_{JA}) is the parameter used to calculate the rise of a device junction temperature due to its power dissipation. For the LM20 the equation used to calculate the rise in the die temperature is as follows:

$$T_J = T_A + \theta_{JA}\,[(V^+ I_Q) + (V^+ - V_O)\, I_L]$$

where I_Q is the quiescent current and I_L is the load current on the output. Since the LM20's junction temperature is the actual temperature being measured care should be taken to minimize the load current that the LM20 is required to drive.

The tables shown in *Figure 3* summarize the rise in die temperature of the LM20 without any loading, and the thermal resistance for different conditions.

2.0 Mounting (Continued)

	SC70-5 no heat sink		SC70-5 small heat sink	
	θ_{JA} (˚C/W)	$T_J - T_A$ (˚C)	θ_{JA} (˚C/W)	$T_J - T_A$ (˚C)
Still air	412	0.2	350	0.19
Moving air	312	0.17	266	0.15

See *Figure 1* for PCB layout samples.

	micro SMD no heat sink		micro SMD small heat fin	
	θ_{JA} (˚C/W)	$T_J - T_A$ (˚C)	θ_{JA} (˚C/W)	$T_J - T_A$ (˚C)
Still air	340	0.18	TBD	TBD
Moving air	TBD	TBD	TBD	TBD

FIGURE 3. Temperature Rise of LM20 Due to Self-Heating and Thermal Resistance (θ_{JA})

3.0 Capacitive Loads

The LM20 handles capacitive loading well. Without any precautions, the LM20 can drive any capacitive load less than 300 pF as shown in *Figure 4*. Over the specified temperature range the LM20 has a maximum output impedance of 160 Ω. In an extremely noisy environment it may be necessary to add some filtering to minimize noise pickup. It is recommended that 0.1 µF be added from V^+ to GND to bypass the power supply voltage, as shown in *Figure 5*. In a noisy environment it may even be necessary to add a capacitor from the output to ground with a series resistor as shown in *Figure 5*. A 1 µF output capacitor with the 160 Ω maximum output impedance and a 200 Ω series resistor will form a 442 Hz lowpass filter. Since the thermal time constant of the LM20 is much slower, the overall response time of the LM20 will not be significantly affected.

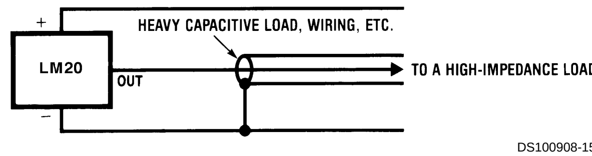


FIGURE 4. LM20 No Decoupling Required for Capacitive Loads Less than 300 pF.

R (Ω)	C (µF)
200	1
470	0.1
680	0.01
1 k	0.001

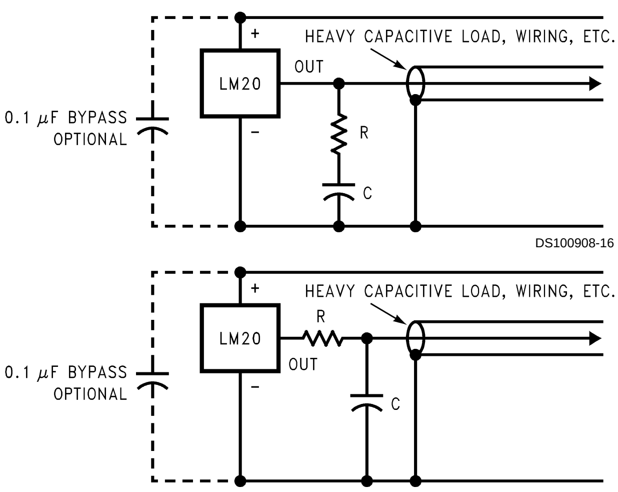


FIGURE 5. LM20 with Filter for Noisy Environment and Capacitive Loading greater than 300 pF. Either placement of resistor as shown above is just as effective.

4.0 LM20 micro SMD Light Sensitivity

Exposing the LM20 micro SMD package to bright sunlight may cause the output reading of the LM20 to drop by 1.5V. In a normal office environment of fluorescent lighting the output voltage is minimally affected (less than a millivolt drop). In either case it is recommended that the LM20 micro SMD be placed inside an enclosure of some type that minimizes its light exposure. Most chassis provide more than ample protection. The LM20 does not sustain permanent damage from light exposure. Removing the light source will cause LM20's output voltage to recover to the proper value.

5.0 Applications Circuits

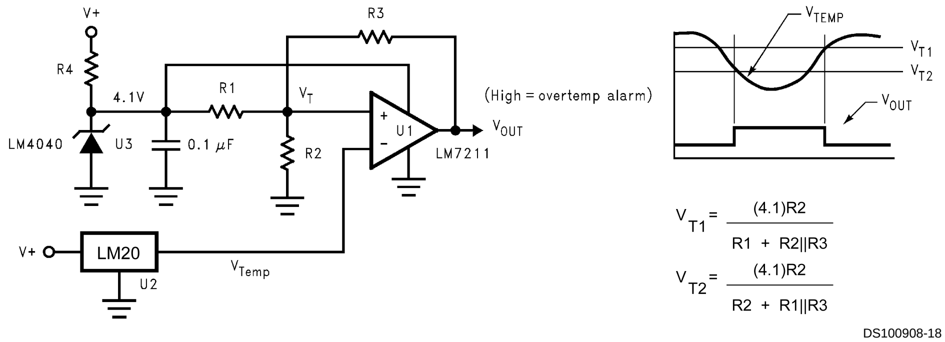


FIGURE 6. Centigrade Thermostat

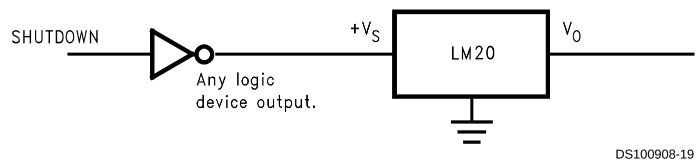
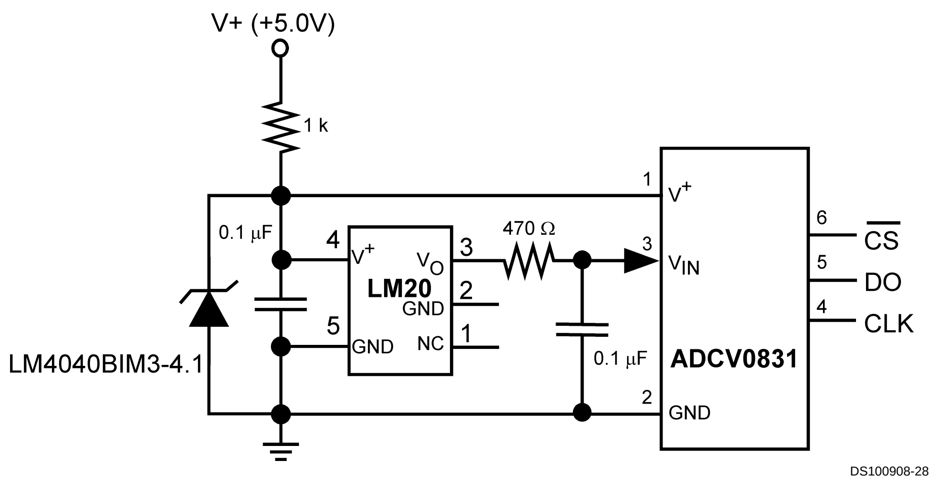


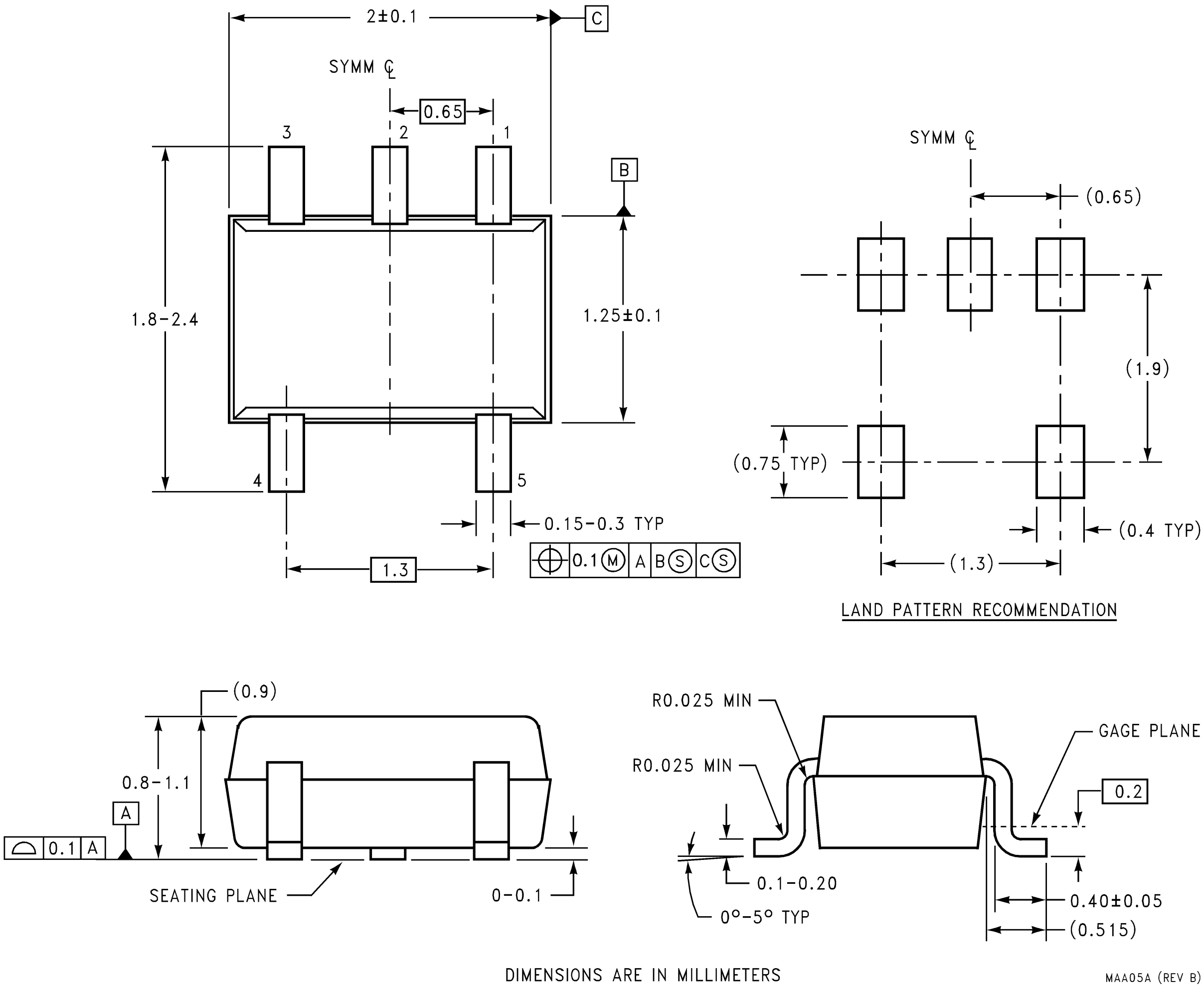
FIGURE 7. Conserving Power Dissipation with Shutdown



Most CMOS ADCs found in ASICs have a sampled data comparator input structure that is notorious for causing grief to analog output devices such as the LM20 and many op amps. The cause of this grief is the requirement of instantaneous charge of the input sampling capacitor in the ADC. This requirement is easily accommodated by the addition of a capacitor. Since not all ADCs have identical input stages, the charge requirements will vary necessitating a different value of compensating capacitor. This ADC is shown as an example only. If a digital output temperature is required please refer to devices such as the LM74.

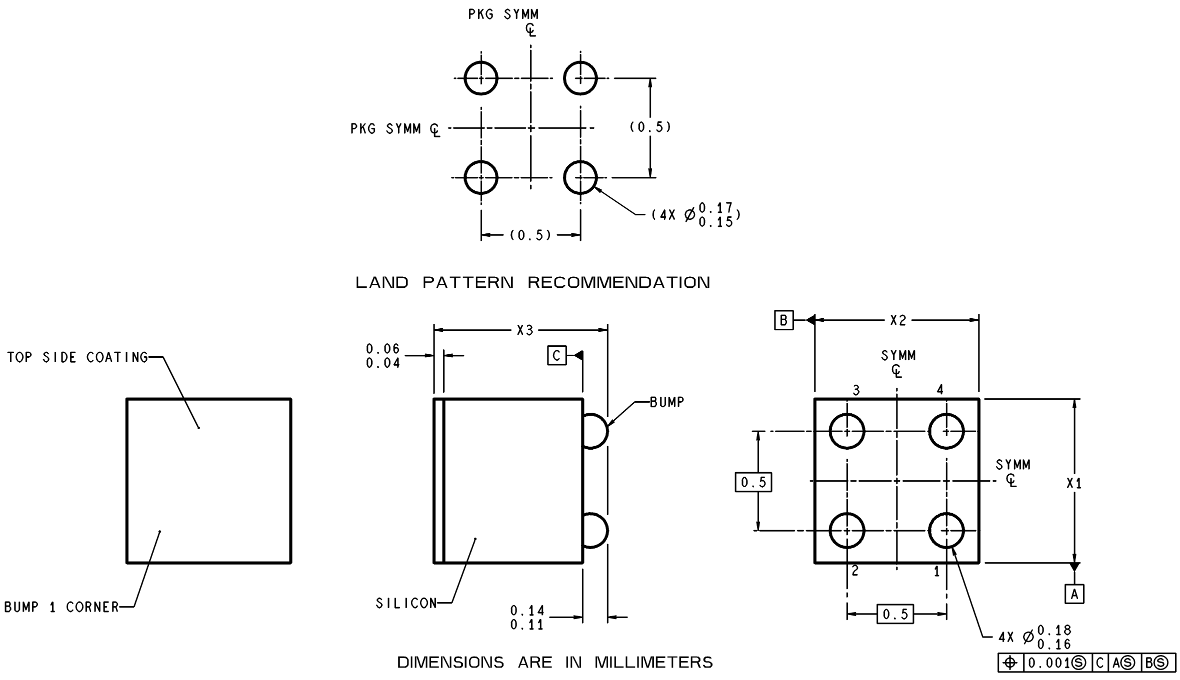
FIGURE 8. Suggested Connection to a Sampling Analog to Digital Converter Input Stage

Physical Dimensions inches (millimeters) unless otherwise noted



5-Lead SC70 Molded Package
Order Number LM20BIM7 or LM20CIM7X
NS Package Number MAA05A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



BPA04XXX (Rev B)

4-Bump micro SMD Ball Grid Array Package
Order Number LM20SIBP or LM20SIBPX
NS Package Number BPA04DDC
The following dimensions apply to the BPA04DDC package shown above: X1=X2 = 853µm ±30µm, X3= 900µm ±50µm

LIFE SUPPORT POLICY

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RF2153

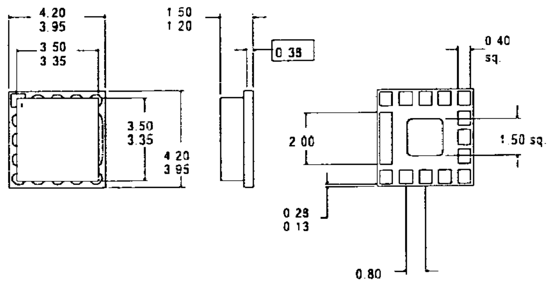
CDMA/TDMA/PACS 1900MHZ 3V POWER AMPLIFIER

Typical Applications

- PACS Handsets and Base Stations
- 3V 1850-1910MHz CDMA PCS Handsets
- 3V 1750-1780MHz CDMA PCS Handsets
- 3V TDMA PCS Handsets
- Spread Spectrum Systems
- Commercial and Consumer Systems

Product Description

The RF2153 is a high-power, high-efficiency linear amplifier IC targeting 3V handheld systems. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as the final RF amplifier in 3V CDMA and TDMA hand-held digital equipment, spread spectrum systems, and other applications in the 1750MHz to 1910MHz band. The device is packaged in a compact 4mmx4mm (LCC). The device's frequency response can be optimized for linear performance in the 1750MHz to 1910MHz band.

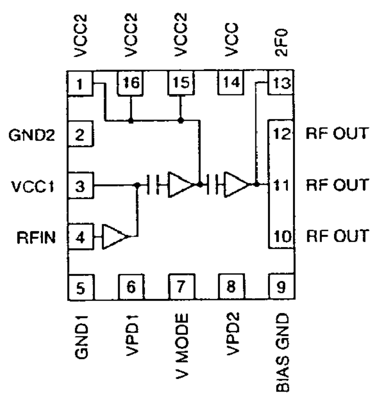


ALL SOLDER PAD TOLERANCES ±0.05mm

Package Style: MP16K01A

Optimum Technology Matching® Applied

- [ ] Si BJT
- [x] GaAs HBT
- [ ] GaAs MESFET
- [ ] Si Bi-CMOS
- [ ] SiGe HBT
- [ ] Si CMOS



Functional Block Diagram

Features

- Single 3V Supply
- 29dBm Linear Output Power
- 30dB Linear Gain
- 33% Linear Efficiency CDMA
- 40% Linear Efficiency TDMA
- On-board Power Down Mode

Ordering Information

RF2153	CDMA/TDMA/PACS 1900MHz 3V Power Amplifier
RF2153 PCBA	Fully Assembled Evaluation Board

RF Micro Devices, Inc.
7625 Thorndike Road
Greensboro, NC 27409, USA
Tel (336) 664 1233
Fax (336) 664 0454
http://www.rfmd.com

Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (RF off)	+8.0	V_{DC}
Supply Voltage (P_{OUT}≤31dBm)	+4.5	V_{DC}
Mode Voltage (V_{MODE})	+3.5	V_{DC}
Control Voltage (V_{PD})	+3.5	V_{DC}
Input RF Power	+10	dBm
Operating Case Temperature	-30 to +85	°C
Storage Temperature	-30 to +150	°C

Caution! ESD sensitive device.

RF Micro Devices believes the furnished information is correct and accurate at the time of this printing. However, RF Micro Devices reserves the right to make changes to its products without notice. RF Micro Devices does not assume responsibility for the use of the described product(s).

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall - CDMA					T=25°C, V_{CC}=3.4V unless otherwise specified
Usable Frequency Range	1750		1910	MHz	
Typical Frequency Range		1750-1780		MHz	Output Matching Network Tune
		1850-1910		MHz	Output Matching Network Tune
Small Signal Gain	30	32	34	dB	V_{MODE}=Low 0V to 0.5V
Linear Gain	28	30		dB	V_{MODE}=High 2.5V to 3V P_{OUT}=29dBm, V_{CC}=3.4V, V_{REG}=2.8V
Second Harmonic (including second harmonic trap)		-35		dBc	
Third Harmonic		-40		dBc	
Fourth Harmonic		-45		dBc	
Minimum Linear Output Power (CDMA or TDMA Modulation)	29			dBm	
Idle Current		100		mA	V_{MODE}=>2.5V
CDMA Linear Efficiency	30	33			P_{OUT}=29dBm, V_{CC}=3.4V, V_{REG}=2.8V
CDMA Adjacent Channel Power Rejection @ 1.25MHz		-46	-44	dBc	P_{OUT}=29dBm, V_{CC}=3.4V, V_{REG}=2.8V
Minimum Linear Output Power (CDMA Modulation)	28	+29		dBm	V_{CC}=3.0V, V_{REG}=2.8V
Input VSWR		< 2:1			
Output Load VSWR	5:1				
Overall - TDMA					T=25°C, V_{CC}=3.4V unless otherwise specified
Idle Current		250	500	mA	V_{MODE}=0V to 0.5V
TDMA Linear Efficiency	30	40		%	P_{OUT}=30dBm, V_{CC}=3.4V, V_{REG}=2.8V
TDMA ACP @ 30kHz		-29	-28	dBc	P_{OUT}=30dBm
TDMA ALT @ 60kHz		-49	-48	dBc	P_{OUT}=30dBm
Power Supply					
Power Supply Voltage	3.0	3.4	4.5	V	
V_{PD} Current		10	15	mA	Total pins 7 and 8
Turn On/Off time			100	ns	
Total Current (Power down)			10	µA	V_{PD} = low
V_{PD} "Low" Voltage		0	0.2	V	
V_{PD} "High" Voltage	2.7	2.8	2.9	V	
MODE "High" Voltage	2.5	2.8		V	
MODE "Low" Voltage		0	0.5	V	
Stability		3:1			Inband
		20:1			Outband
Spurious		<-60		dBc	
Noise Power		-136		dB/Hz	@ 80MHz offset

1.SCOPE

This Product specification is applied to SAFC1867.5T1897.5ML1D0T-TC00, the 1800MHz range SAW Filter used for communication equipment.

Please contact us when using this product for any other applications than described in the above.

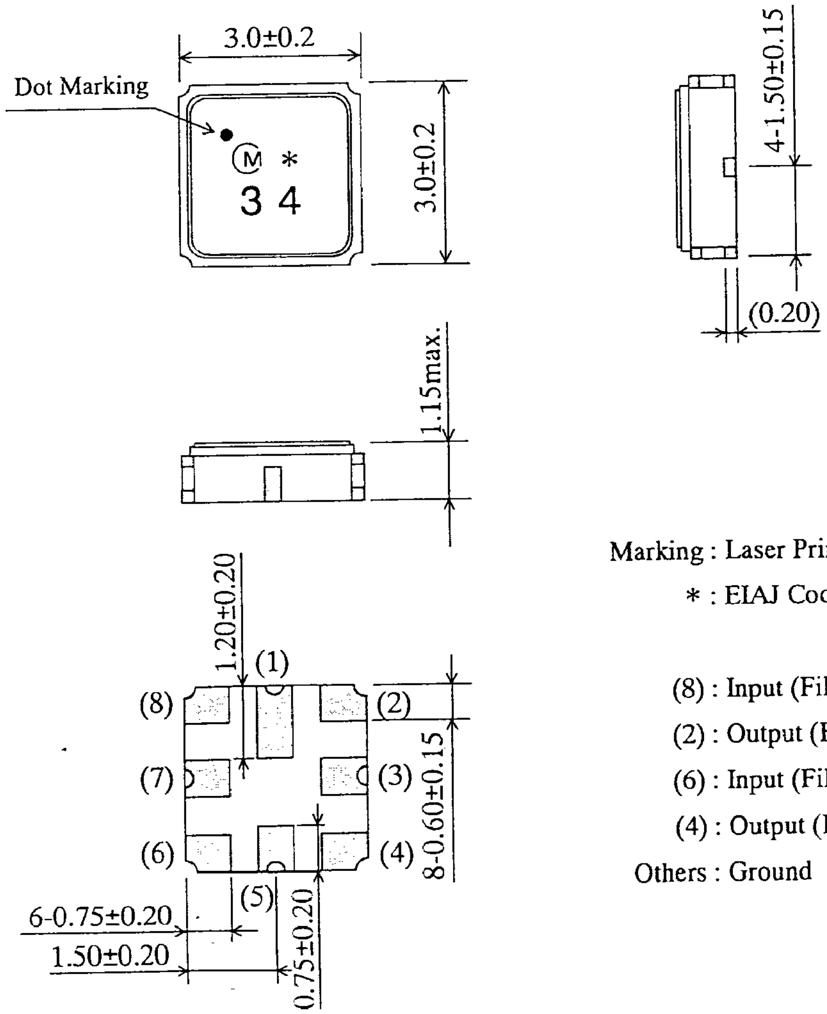
2. CUSTOMER NUMBER

Customer's Part No.		Customer's Drawing No.	

3. MURATA PART NUMBER

SAFC1867.5T1897.5ML1D0T	:	BULK PACKING
SAFC1867.5T1897.5ML1D0T-TC00	:	TAPING PACKING (10000pcs)

4. DIMENSIONS



Marking : Laser Printing

* : EIAJ Code

(8) : Input (Filter 1:1867.5MHz)

(2) : Output (Filter 1:1867.5MHz)

(6) : Input (Filter 2:1897.5MHz)

(4) : Output (Filter 2:1897.5MHz)

Others : Ground

Unit : mm

5. MAXIMUM RATINGS

5.1	Withstanding Voltage for short Term between each Terminal	Maximum Rating 10V (Insulation Resistance 10MΩ min. , 25±2°C)
5.2	D. C. Voltage between each Terminal	Maximum Rating 3V (25±2°C)
5.3	Input Signal Level	10mW (+10dBm), 8000 hours
5.4	Operating Temperature Range	-30°C ... + 80°C
5.5	Storage Temperature Range	-40°C ... + 85°C

6. ELECTRICAL CHARACTERISTICS

< Input(8), Output(2), Ground(others): Measurement Circuit (a-1) >

	Item	Specifications	Typical (Reference value at 25±2°C)
6-1	Nominal Center Frequency (fc)	1867.5 MHz	-
6-2	Insertion Loss		
	1) within 1850 ... 1885 MHz (Pass Bandwidth)	3.2 dB max.	2.0 dB
	2) within 1589 ... 1625 MHz	25 dB min.	28 dB
	3) within 1719 ... 1755 MHz	30 dB min.	37 dB
	4) within 1930 ... 1965 MHz	32 dB min.	37 dB
	5) within 2020 ... 2095 MHz	25 dB min.	30 dB
	6) within 2190 ... 2305 MHz	28 dB min.	32 dB
	7) within 3700 ... 3770 MHz	20 dB min.	27 dB
6-3	Ripple Deviation (within 1850 ... 1885 MHz)	2.0 dB max.	0.7 dB
6-4	V.S.W.R. (within 1850 ... 1885 MHz)	2.0 max.	1.5
6-5	Input / Output Impedance (nominal)	50Ω	-

< Input(6), Output(4), Ground(others): Measurement Circuit (a-2) >

	Item	Specifications	Typical (Reference value at 25±2°C)
6-1	Nominal Center Frequency (fc)	1897.5 MHz	-
6-2	Insertion Loss		
	1) within 1885 ... 1910 MHz (Pass Bandwidth)	3.2 dB max.	2.0 dB
	2) within 1624 ... 1650 MHz	25 dB min.	30 dB
	3) within 1754 ... 1780 MHz	28 dB min.	32 dB
	4) within 1965 ... 1990 MHz	32 dB min.	40 dB
	5) within 2055 ... 2120 MHz	25 dB min.	32 dB
	6) within 2225 ... 2330 MHz	30 dB min.	35 dB
	7) within 3770 ... 3820 MHz	18 dB min.	22 dB
6-3	Ripple Deviation (within 1885 ... 1910 MHz)	2.0 dB max.	0.7 dB
6-4	V.S.W.R. (within 1885 ... 1910 MHz)	2.0 max.	0.7
6-5	Input / Output Impedance (nominal)	50Ω	-

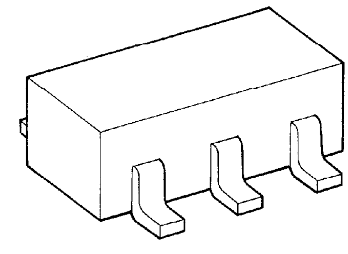
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7SU04F, TC7SU04FU

INVERTER

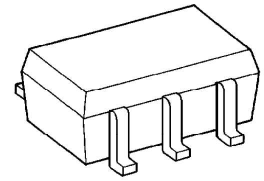
The TC7SU04 is a high speed C^2MOS INVERTER fabricated with silicon gate C^2MOS technology.
It achieves high speed operation similar to equivalent LSTTL while maintaining the C^2MOS low power dissipation.
The internal circuit is composed of single stages inverter, it can be applied for crystal oscillation.
The input is equipped with protection circuits against static discharge or transient excess voltage.
Output currents are 1 / 2 compared to TC74HC series models.

TC7SU04F



SSOP5-P-0.95

TC7SU04FU



SSOP5-P-0.65A

Weight SSOP5-P-0.95 : 0.016g (Typ.)
SSOP5-P-0.65A : 0.006g (Typ.)

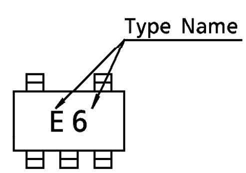
FEATURES

- High Speed .... t_{pd} = 7ns (Typ.) at V_{CC} = 5V
- Low Power Dissipation .... I_{CC} = 1μA (Max.) at Ta = 25°C
- High Noise Immunity .... $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Output Drive Capability .... 5 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL}$ = 2mA (Min.)
- Balanced Propagation Delays ...... $t_{pLH} \fallingdotseq t_{pHL}$
- Wide Operating Voltage Range ... $V_{CC(opr)}$ = 2~6V

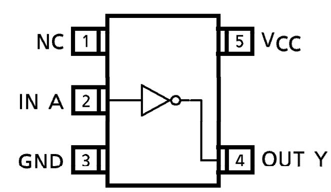
MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	−0.5~7	V
DC Input Voltage	V_{IN}	−0.5~V_{CC}+0.5	V
DC Output Voltage	V_{OUT}	−0.5~V_{CC}+0.5	V
Input Diode Current	I_{IK}	±20	mA
Output Diode Current	I_{OK}	±20	mA
DC Output Current	I_{OUT}	±12.5	mA
DC V_{CC} / Ground Current	I_{CC}	±25	mA
Power Dissipation	P_D	200	mW
Storage Temperature	T_{stg}	−65~150	°C
Lead Temperature (10s)	T_L	260	°C

MARKING

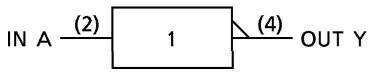


PIN ASSIGNMENT (TOP VIEW)



961001EBA2

LOGIC DIAGRAM



RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	2~6	V
Input Voltage	V_{IN}	0~V_{CC}	V
Output Voltage	V_{OUT}	0~V_{CC}	V
Operating Temperature	T_{opr}	−40~85	°C

DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION			Ta = 25°C			Ta = −40~85°C		UNIT
				V_{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Input Voltage	V_{IH}	—		2.0	1.7	—	—	1.7	—	V
				4.5	3.6	—	—	3.6	—	
				6.0	4.8	—	—	4.8	—	
Low-Level Input Voltage	V_{IL}	—		2.0	—	—	0.3	—	0.3	V
				4.5	—	—	0.9	—	0.9	
				6.0	—	—	1.2	—	1.2	
High-Level Output Voltage	V_{OH}	$V_{IN} = V_{IL}$	$I_{OH} = -20\mu A$	2.0	1.8	2.0	—	1.8	—	V
				4.5	4.0	4.5	—	4.0	—	
				6.0	5.5	5.9	—	5.5	—	
			$I_{OH} = -2mA$	4.5	4.18	4.31	—	4.13	—	
			$I_{OH} = -2.6mA$	6.0	5.68	5.80	—	5.63	—	
Low-Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$	$I_{OL} = 20\mu A$	2.0	—	0.0	0.2	—	0.2	V
				4.5	—	0.0	0.2	—	0.5	
				6.0	—	0.0	0.5	—	0.5	
			$I_{OL} = 2mA$	4.5	—	0.17	0.26	—	0.33	
			$I_{OL} = 2.6mA$	6.0	—	0.18	0.26	—	0.33	
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC}$ or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND		6.0	—	—	1.0	—	10.0	μA

Output currents are 1/2 compared to TC74HC series models.

AC ELECTRICAL CHARACTERISTICS ($C_L = 15pF$, Input $t_r = t_f = 6ns$, $V_{CC} = 5V$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}	—	—	5	10	ns
Propagation Delay Time	t_{pLH} t_{pHL}	—	—	7	15	ns

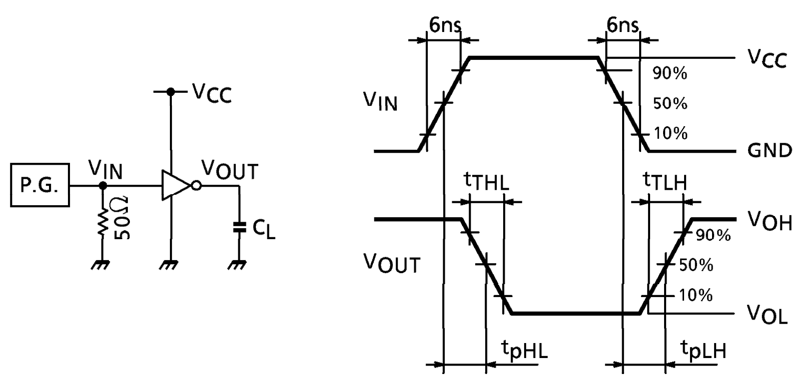
AC ELECTRICAL CHARACTERISTICS ($C_L = 50pF$, Input $t_r = t_f = 6ns$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{CC}	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}	—	2.0	—	50	125	—	155	ns
			4.5	—	14	25	—	31	ns
			6.0	—	12	21	—	26	ns
Propagation Delay Time	t_{pLH} t_{pHL}	—	2.0	—	48	100	—	125	ns
			4.5	—	12	20	—	25	ns
			6.0	—	9	17	—	21	ns
Input Capacitance	C_{IN}	—		—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD}	(Note 1)		—	10	—	—	—	pF

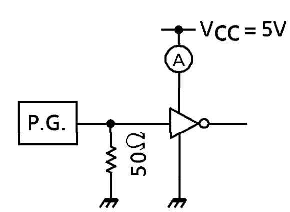
Note 1 : C_{PD} defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit).
Average operating current can be obtained by the equation hereunder.

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

SWITCHING CHARACTERISTICS TEST CIRCUIT



$I_{CC(opr)}$ TEST CIRCUIT

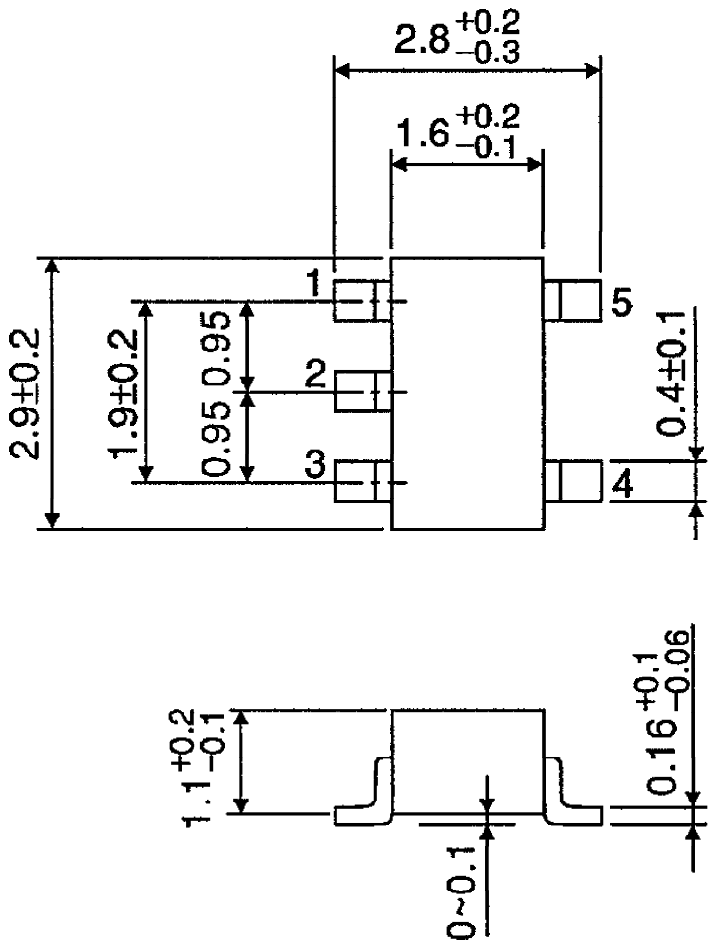


Input waveform is the same as that in case of switching characteristics test.

OUTLINE DRAWING

SSOP5-P-0.95

Unit : mm

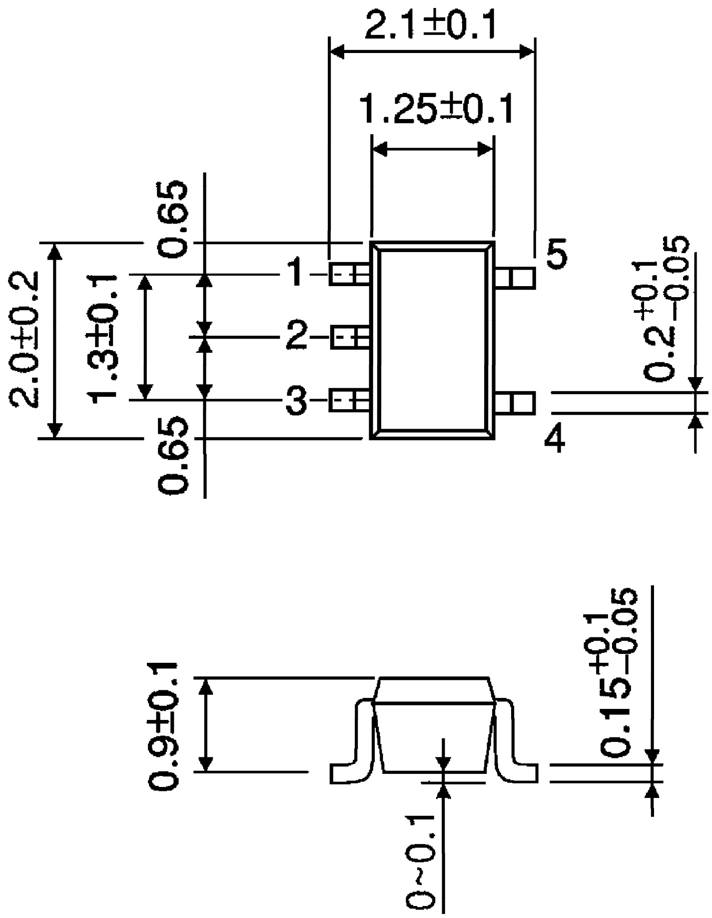


Weight : 0.016g (Typ.)

OUTLINE DRAWING

SSOP5-P-0.65A

Unit : mm



Weight : 0.006g (Typ.)

DATA SHEET

NEC

GaAs INTEGRATED CIRCUIT

μPG158TB

L, S- BAND SPDT SWITCH

DESCRIPTION

The μPG158TB is a L-band SPDT (Single Pole Double Throw) GaAs FET switch which was developed for digital cellular, cordless telephone and other L, S-band wireless application. The device can operate from 500 MHz to 2.5 GHz, having the low insertion loss. It housed in an original 6-pin super minimold package that is smaller than usual 6-pin minimold easy to install and contributes to miniaturizing the system.

FEATURES

- Low Insertion Loss: L_{INS} = 0.3 dB TYP. @V_{CONT} = +3.0 V/0 V, f = 1 GHz
  L_{INS} = 0.4 dB TYP. @V_{CONT} = +3.0 V/0 V, f = 2 GHz
  L_{INS} = 0.5 dB TYP. @V_{CONT} = +3.0 V/0 V, f = 2.5 GHz
- ★ High isolation: ISL = 27 dB TYP. @V_{CONT} = +3.0 V/0 V, f = 0.5 to 2 GHz
- Small 6-pin super minimold package (Size: 2.0 × 1.25 × 0.9 mm)

APPLICATIONS

- L, S-band digital cellular or cordless telephone
- PCS, WLAN, WLL and Bluetooth applications

ORDERING INFORMATION

Part Number	Marking	Package	Supplying Form
μPG158TB-E3	G1M	6-pin super minimold	Embossed tape 8 mm wide. Pin 1, 2, 3 face to tape perforation side. Qty 3 kp/reel.

Remark To order evaluation samples, please contact your local NEC sales office. (Part number for sample order: μPG158TB)

Caution **The IC must be handled with care to prevent static discharge because its circuit is composed of GaAs MES FET.**

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

Document No. P14267EJ2V0DS00 (2nd edition)
Date Published November 1999 N CP(K)
Printed in Japan

The mark ★ shows major revised points.

ABSOLUTE MAXIMUM RATINGS (T_A = +25 °C)

Parameter	Symbol	Ratings	Unit
Control Voltage 1, 2	$V_{CONT1,2}$	–6.0 to +6.0 [Note]	V
Input Power	P_{in}	+28	dBm
Total Power Dissipation	P_{tot}	0.15	W
Operating Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–45 to +150	°C

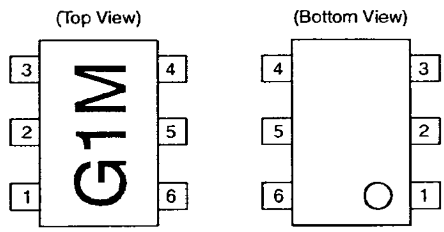
Note Condition 2.5 ≤ | V_{CONT1} – V_{CONT2}| ≤ 6.0 V

Remarks 1. Mounted on a 50 × 50 × 1.6 mm double copper clad epoxy glass PWB, T_A = +85 °C

2. Operation in excess of any one of these parameters may result in permanent damage.

PIN CONNECTIONS

Pin No.	Connection	Pin No.	Connection
1	OUT1	4	V_{CONT2}
2	GND	5	IN
3	OUT2	6	V_{CONT1}



RECOMMENDED OPERATING CONDITIONS (T_A = +25 °C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Control Voltage (High)	V_{CONT}	+2.5	+3.0	+5.3	V
Control Voltage (Low)	V_{CONT}	–0.2	0	+0.2	V

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, T_A = +25 °C, V_{CONT1} = 3 V, V_{CONT2} = 0 V or V_{CONT1} = 0 V, V_{CONT2} = 3 V, Off chip DC blocking capacitors value; 51 pF)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	L_{INS}	f = 0.5 to 1.0 GHz	–	0.3	0.55	dB
		f = 2.0 GHz	–	0.4	0.65	
		f = 2.5 GHz	–	0.5[Note1]	–	
Isolation	ISL	f = 0.5 to 2.0 GHz	22	27	–	dB
		f = 2.5 GHz	–	23[Note1]	–	
Input Return Loss	RL_{in}	f = 0.5 to 2.0 GHz	13	19	–	dB
Output Return Loss	RL_{out}	f = 0.5 to 2.0 GHz	13	19	–	dB
Input Power at 0.1 dB Compression Point[Note2]	$P_{in(0.1\ dB)}$	f = 1.0 GHz, V_{CONT} = 3 V/0 V	–	23.0	–	dBm
Input Power at 1 dB Compression Point[Note2]	$P_{in(1\ dB)}$	f = 1.0 GHz, V_{CONT} = 3 V/0 V	22.0	26.5	–	dBm
Switching Speed	t_{sw}		–	50	200	ns
Control Current	I_{CONT}	V_{CONT} = 3 V/0 V	–	0.5	10	μA

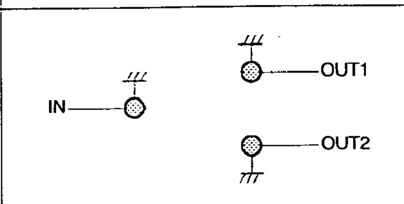
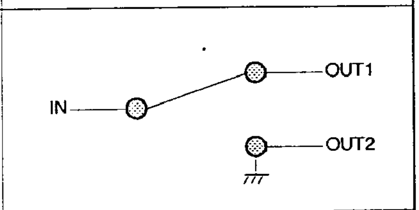
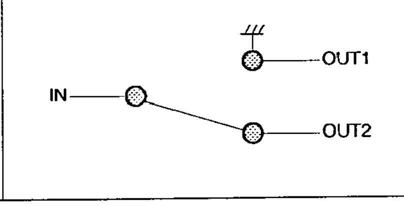
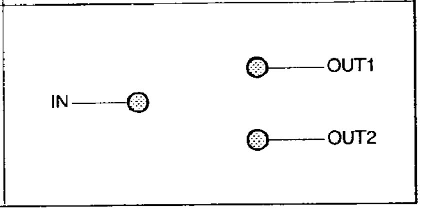
Notes 1. Characteristic for reference at 2.0 to 2.5 GHz

2. $P_{in(0.1\ dB)}$ or $P_{in(1\ dB)}$ is measured the input power level when the insertion loss increases more 0.1 dB or 1 dB than that of linear range. All other characteristics are measured in linear range.

Cautions 1. When the μPG158TB is used it is necessary to use DC blocking capacitors for No. 1 (OUT1), No.3 (OUT2) and No.5 (IN). The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, band width, switching speed and the condition with actual board of your system.
The range of recommended DC blocking capacitor value is less than 100 pF.

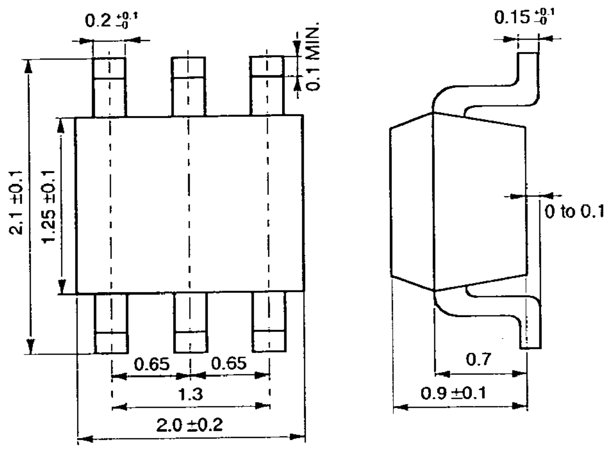
2. The distance between IC's GND pin and ground pattern of substrate should be as shorter as possible to avoid parasitic parameters.

TRUTH TABLE OF SWITCHING BY CONDITION OF CONTROL VOLTAGE

		V_{CONT1}	
		$V_{CONT(H)}$	$V_{CONT(L)}$
V_{CONT2}	$V_{CONT(H)}$		
	$V_{CONT(L)}$		

PACKAGE DIMENSIONS

6 PIN SUPER MINIMOLD (UNIT: mm)



SCP-5000/H_US Adjustment Description for Mass Production

Model Code NO.	1-163-269-00	1-163-269-01
Model NO.	SCP-5000S/H_US	SCP-5000S/H_US_MJ

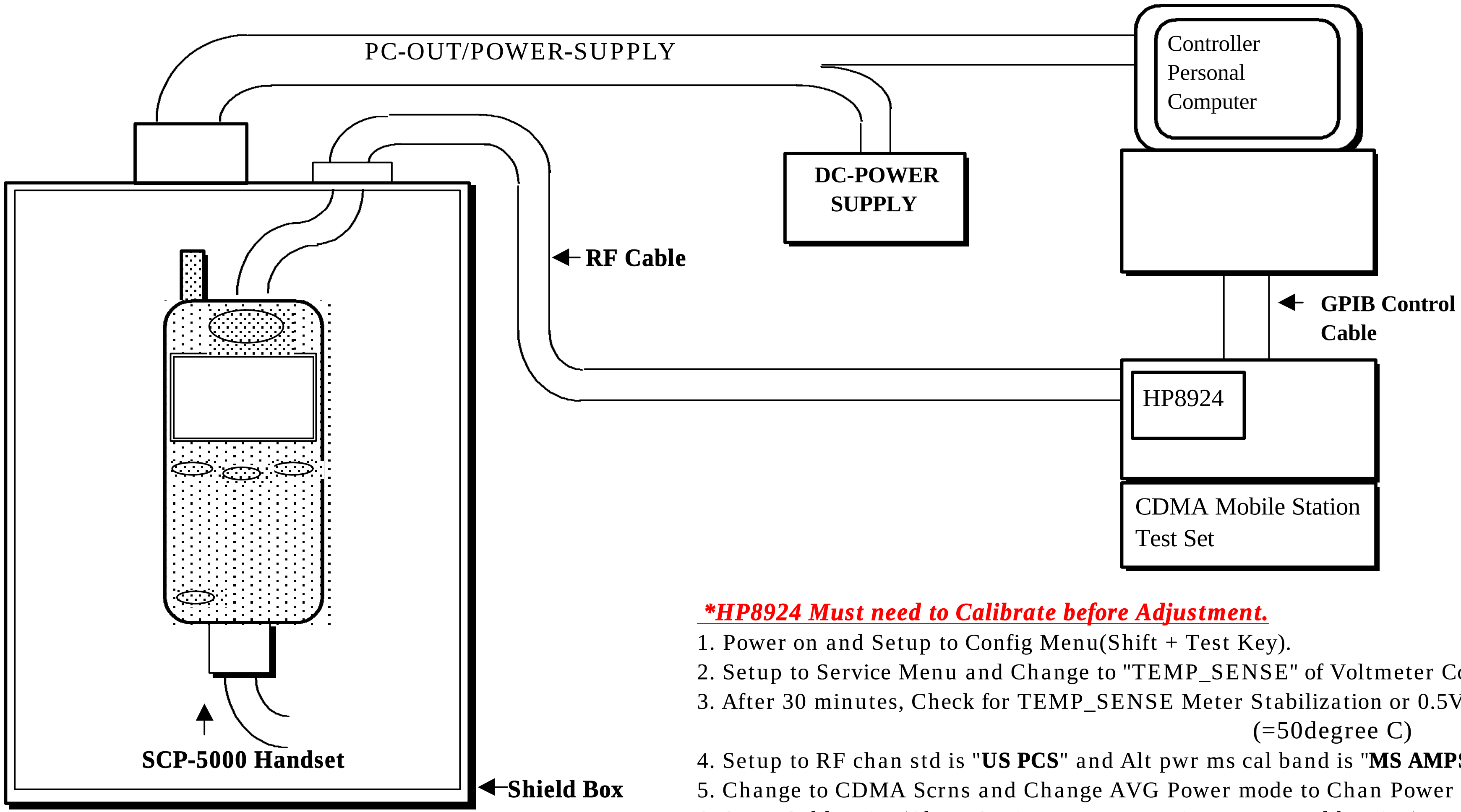
Eng.Section	**Personal Telecommunication Division Technical Engineering Department RF Section**
NAME	**A.Shimahara**

No.	Contents
1	**Set-Up for Tune-Up and Adjustment of Transmitter**
2	**Alignment Procedure**
3	**Adjustment Value**

Minor Change Version

NO.		

1.Set-Up for Tune-Up and Adjustment of Transmitter

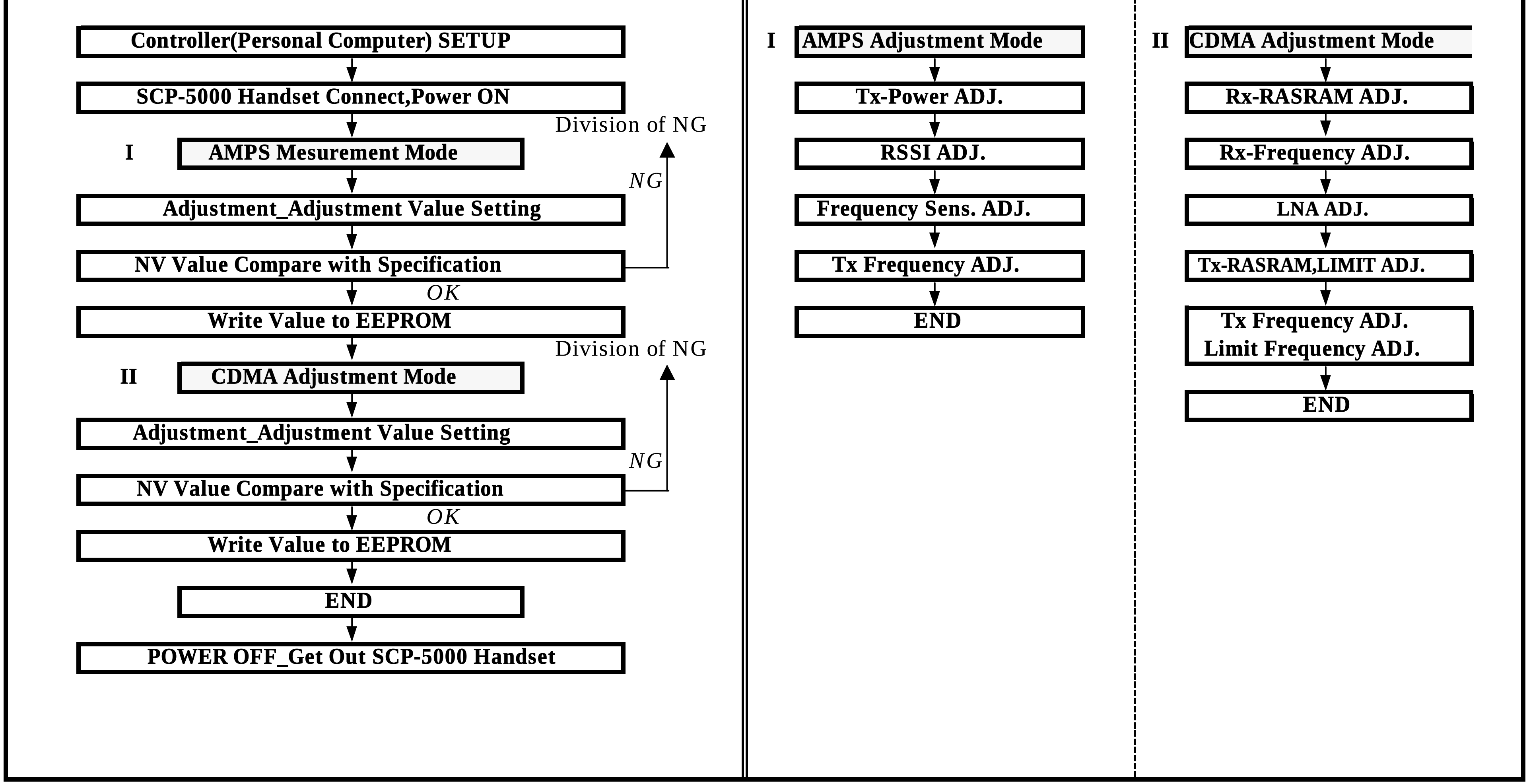


HP8924 Must need to Calibrate before Adjustment.

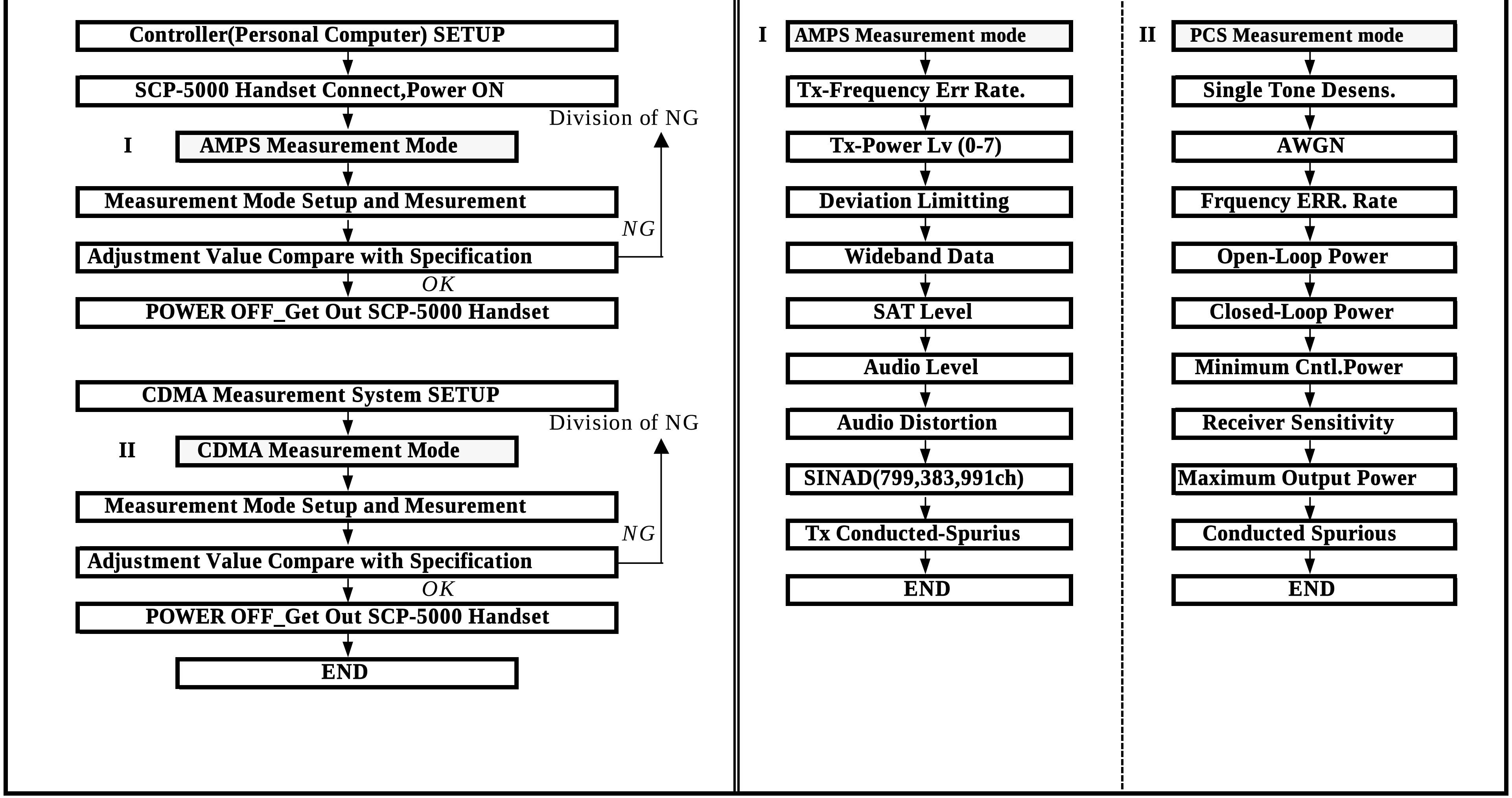
1. Power on and Setup to Config Menu(Shift + Test Key).
2. Setup to Service Menu and Change to "TEMP_SENSE" of Voltmeter Connection .
3. After 30 minutes, Check for TEMP_SENSE Meter Stabilization or 0.5V.
   (=50degree C)
4. Setup to RF chan std is "**US PCS**" and Alt pwr ms cal band is "**MS AMPS**".
5. Change to CDMA Scrns and Change AVG Power mode to Chan Power mode.
6. Start Calibration(About 3 minutes : Transmitter tester calibration).
7. Next, Return to Config Menu and Start Rfgen Lvl Calibration(few Seconds).

2 Alignment Procedure

(1)Adjustment Procedure



(2)Measurement Procedure



3.Adjustment Value

1.AMPS Adjustment

ITEM	Sub-ITEM	Handset Setup(Internal Setup)	HP8924 Setup	Adj. Value	Accuracy of NV-Value
Tx-Power Adjustment	PL=0,1,2	Normal Test Mode	AMPS Mode	+24.5dBm	
	PL=3	Tx AGC SET : 3-2-3-2	Txpower :dBm Mode	+23.0dBm	
	PL=4			+19.0dBm	
	PL=5			+15.0dBm	
	PL=6			+11.0dBm	
	PL=7			+ 7.0dBm	
Tx-Power Frequency Adjustment	Bk 0=1017ch	FCC Test Mode	Set "PL=0"	+24.2dBm	
	Bk 1=46ch			+24.5dBm	
	Bk 2=98ch			+24.5dBm	
	Bk 3=150ch			+24.5dBm	
	Bk 4=202ch			+24.5dBm	
	Bk 5=254ch			+24.5dBm	
	Bk 6=306ch			+24.5dBm	
	Bk 7=358ch			+24.5dBm	
	Bk 8=410ch			+24.5dBm	
	Bk 9=462ch			+24.5dBm	
	Bk10=514ch			+24.5dBm	
	Bk11=566ch			+24.5dBm	
	Bk12=618ch			+24.8dBm	
	Bk13=670ch			+24.8dBm	
	Bk14=722ch			+24.8dBm	
	Bk15=774ch			+24.8dBm	
Frequency Sensibility Adjustment		FCC Test Mode : AMPS Tx : ST,CH : 358	AF ANL Mode Detector : Pk±Max DE-EMPH:750us Fil1:>20hz,Fil2:<99khz pass	8KHz dev.	dev. 8Khz±0.1Khz ↓ NV_FM_FREQ_SENSE_GAIN_I
RSSI Adjustment	-85dBm In -113dBm In	FCC TEST Mode RSSI=Filter*100+AgcRSSI*47	-85dBm RFINPUT;-113dBm RFINPUT	-85dBm : BAR4 BAR1	NV_FM_RSSI_I

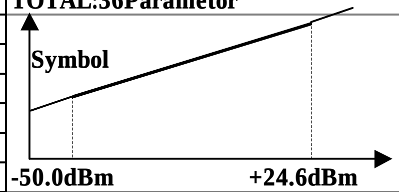
*Handset SETUP & HP8923 SETUP is Auto Set by Controller(Personal Computer).

2.PCS RX Adjustment

ITEM	Sub-ITEM	Handset Setup(Internal Setup)	HP8924 Setup	Adj. Value	Accuracy of NV-Value
Rx-RASRAM Adjustment	Table 1	Normal Mode	CDMA Ch=563 :SG LV=-106.0dBm	-106.0dBm	
	Table 2	OFF Line Mode	SG LV=-100.6dBm	-100.6dBm	
	Table 3		SG LV=-95.3dBm	-95.3dBm	
	Table 4		SG LV=-90.0dBm	-90.0dBm	
	Table 5		SG LV=-84.7dBm	-84.7dBm	
	Table 6		SG LV=-79.4dBm	-79.4dBm	
	Table 7		SG LV=-74.1dBm	-74.1dBm	
	Table 8		SG LV=-68.8dBm	-68.8dBm	
	Table 9		SG LV=-63.5dBm	-63.5dBm	
	Table 10		SG LV=-58.1dBm	-58.1dBm	
	Table 11		SG LV=-52.8dBm	-52.8dBm	
	Table 12		SG LV=-47.5dBm	-47.5dBm	
	Table 13		SG LV=-42.2dBm	-42.2dBm	
	Table 14		SG LV=-36.9dBm	-36.9dBm	
	Table 15		SG LV=-31.6dBm	-31.6dBm	
	Table 16		SG LV=-26.3dBm	-26.3dBm	
	Table 17		SG LV=-21.0dBm	-21.0dBm	
RX AGC Frequency Adjustment	Bk 0=1017ch	Normal Mode	RF INPUT(SG) LV=-63.5dBm	AGC DIFF.	
	Bk 1=46ch	Reference ch :563ch	Change to Channel 16 Time.	AGC DIFF.	
	Bk 2=98ch	Deference of Center ch AGCsym.		AGC DIFF.	
	Bk 3=150ch	Change to Channel 16 Time.		AGC DIFF.	
	Bk 4=202ch	OFF Line Mode		AGC DIFF.	
	Bk 5=254ch			AGC DIFF.	
	Bk 6=306ch			AGC DIFF.	
	Bk 7=358ch			Center CH	
	Bk 8=410ch			AGC DIFF.	
	Bk 9=462ch			AGC DIFF.	
	Bk10=514ch			AGC DIFF.	
	Bk11=566ch			AGC DIFF.	
	Bk12=618ch			AGC DIFF.	
	Bk13=670ch			AGC DIFF.	
	Bk14=722ch			AGC DIFF.	
	Bk15=774ch			AGC DIFF.	

3.PCS TX & TX-LIMIT Adjustment

ITEM	Sub-ITEM	Handset Setup(Internal Setup)	HP8924 Setup	Adj. Value	Accuracy of NV-Value
Tx-RASRAM →		Nomal Test Mode	PCS Ch=1163ch	+24.6dBm	
Adjustment			SG level is ccording to the transmission	-50.0dBm	

			power level of MS		
&		**TOTAL:36Parametor**			
					
Tx-Limit →	**Table 1**		**PCS Ch=1163ch**	**+8.75dBm**	
Adjustment	**Table 2**			**+10.1dBm**	
	Table 3			**+11.4dBm**	
	Table 4			**+12.7dBm**	
	Table 5			**+14.1dBm**	
	Table 6			**+15.4dBm**	
	Table 7			**+16.7dBm**	
	Table 8			**+18.1dBm**	
	Table 9			**+19.4dBm**	
	Table 10			**+20.7dBm**	
	Table 11			**+22.1dBm**	
	Table 12			**+23.4dBm**	
	Table 13			**+24.7dBm**	
	Table 14			**+26.0dBm**	
	Table 15			**+27.4dBm**	
	Table 16			**+28.7dBm**	
	OFFSET	**Offset : 16.7dB(Table 7)**		**+16.7dBm**	
	SPN	**Spn : 26.0dBm(Table 14)**		**+26.0dBm**	

4.Tx AGC Frequency Adjustment and Tx Limit Frequency Adjustment.

TX AGC Frequency Adjustment	**Bk 0=38ch**	**Nomal Test Mode**	**RF INPUT(SG) LV=-92.0dBm**	**Tx-Pow diff.**	
	Bk 1=113ch	**Reference ch :1163ch**	**Change to Channel 16 Time.**	**Tx-Pow diff.**	
	Bk 2=188ch	**Difference of Center ch AGCsym.**		**Tx-Pow diff.**	
	Bk 3=263ch	**Change to Channel 16 Time.**		**Tx-Pow diff.**	
	Bk 4=338ch			**Tx-Pow diff.**	

	Bk 5=413ch			Tx-Pow diff.	
	Bk 6=488ch			Tx-Pow diff.	
	Bk 7=563ch			Tx-Pow diff.	
&	Bk 8=638ch			Tx-Pow diff.	
	Bk 9=713ch			Tx-Pow diff.	
	Bk10=788ch			Tx-Pow diff.	
	Bk11=863ch			Tx-Pow diff.	
	Bk12=938ch			Tx-Pow diff.	
	Bk13=1013ch			Tx-Pow diff.	
	Bk14=1088ch			Tx-Pow diff.	
	Bk15=1163ch			REF. CH	
TX Limit Frequency Adjustment	Bk 0=38ch	Nomal Test Mode	RF INPUT(SG) LV=-92.0dBm	*	
	Bk 1=113ch	Reference ch :1163ch	Change to Channel 16 Time.	*	
	Bk 2=188ch	Difference of Center ch AGCsym.		*	
	Bk 3=263ch	Change to Channel 16 Time.		*	
	Bk 4=338ch			*	
	Bk 5=413ch			*	
	Bk 6=488ch			*	
	Bk 7=563ch	12Symb=1.0dB		*	
	Bk 8=638ch			*	
	Bk 9=713ch			*	
	Bk10=788ch			*	
	Bk11=863ch			*	
	Bk12=938ch			*	
	Bk13=1013ch			*	
	Bk14=1088ch			*	
	Bk15=1163ch			REF. CH	

***TX-Power Diffrencial + ADC Diffrencial×Limit Table Value**

4.Measurement Specification of Adjustment

1.AMPS Mesurement Specification

Measurement Item	Standard Item	IS98A Standard Spec	Measurement Spec	Measurement Condition	Measurement Channel	Others
Tx-Frequency Err	TIA/EIA-98-B:3.1.2	< ±2.5ppm	< ±2.0ppm	Measurement Equipment Accuray < 0.1ppm	383(M)	
Tx-Power Level(0,1,2)	TIA/EIA-98-B:3.2.1	24dBm to 30dBm	23.4dBm to 25.0dBm 23.7dBm to 25.3dBm 24.0dBm to 25.6dBm	Measurement Equipment	991(L) 383(M) 799(H)	
Tx-Power Level(3)	TIA/EIA-98-B:3.2.1	20dBm to 26dBm	20.5dBm to 25.0dBm	Accuray < 0.2dB	383(M)	
Tx-Power Level(4)	TIA/EIA-98-B:3.2.1	16dBm to 22dBm	16.5dBm to 21.5dBm		383(M)	
Tx-Power Level(5)	TIA/EIA-98-B:3.2.1	12dBm to 18dBm	12.5dBm to 17.5dBm		383(M)	
Tx-Power Level(6)	TIA/EIA-98-B:3.2.1	8dBm to 14dBm	8.5dBm to 13.5dBm		383(M)	
Tx-Power Level(7)	TIA/EIA-98-B:3.2.1	4dBm to 10dBm	4.5dBm to 9.5dBm		383(M)	
Deviation Limitting	TIA/EIA-98-B:3.3.2.3	< ±12Khz dev.	< ±12Khz dev.	Comp=ON,SAT=OFF HF Mode,Mic=6.3V IN	383(M)	
Wideband Data	TIA/EIA-98-B:3.3.3	±8Khz dev. ±10%	±8Khz dev. ± 10%	Wideband Mode	383(M)	
SAT Level	TIA/EIA-98-B:3.3.4	±2Khz±0.2Khz dev.	±2Khz±0.2Khz dev.	SAT Mode	383(M)	
ST Level	TIA/EIA-98-B:3.3.5	±8Khz dev. ±10%	±8Khz dev. ± 10%	ST Mode	383(M)	
Audio Distortion	TIA/EIA-98-B:2.2.2.5	< 5%	<5%	Voice Mode 8KHZdev -50dBm	383(M)	
Audio Level			47.0mV ± 3dB	2.9KdeV	383(M)	
SINAD	TIA/EIA-98-B:2.3.1	> 12dB	> 12dB	RF IN = -116.5dBm	991(L),799(H)	

2. PCS Measurement Specification

Measurement Item	Standard Item	IS98C Standard Spec	Measurement Spec	Measurement Condition	Measurement Channel	Others
RTC Demod. of FW.ch	TIA/EIA-98-C 3.3.3			Rateset2 SVC opt9		
AWGN Test10(Eb/Nt=4.1)		1%(0.010)	1%(0.010)	7200(TEST10)	25ch	
Waveform Quality	TIA/EIA-98-C			Rateset2 SVC opt9		
RHO	4.3.2	>0.944	>0.944	14400bps	25ch	
Frequency Err Rate	4.1.1	±150Hz	±150Hz		25ch	
Time Offset	4.3.1	±1uS	±1uS		25ch	
TTC Range of Openloop	TIA/EIA-98-C	dBm	dBm	Rateset2 SVC opt9		
Openloop Power Test1	4.4.1	-51±9.5(CLASS II)	-51±9.5(CLASS II)	14400bps	25ch	
Openloop Power Test2		-11±9.5(CLASS II)	-11±9.5(CLASS II)		25ch	
Openloop Power Test3		20±9.5(CLASS II)	20±9.5(CLASS II)		25ch	
TTC Range of Closedloop	TIA/EIA-98-C			Rateset2 SVC opt9		
Closedloop Full Power	4.4.4	RF Output = -13dBm	-14±3dBm	14400bps	25ch	
Closedloop Max Power		>+24dB	>+24dB			
Closedloop Min Power		<-24dB	<-24dB			
TTC Min.Controlled Pow	TIA/EIA-98-C			Rateset2 SVC opt9		
Minimum Controlled Pow	4.4.6	-50dBm/1.23MHz	-50dBm/1.23MHz	14400bps	25ch	
RTC Receiver Sensitivity	TIA/EIA-98-C	0.5%(Confidence95%)	1.0%(Confidence95%)	Rate2 Full -106.8dBm	600ch, 1175ch	
Receiver Sensitivity FER	3.4.1	0.5%(Confidence95%)	0.5%(Confidence95%)	Rate2 Full -105.7dBm	25ch	
TTC Max RF Output Pow	TIA/EIA-98-C		21.8dBm~23.1dBm		25ch, 600ch	
Max Power Output	4.4.5	> 0.2W	21.8dBm~23.4dBm		1175ch	
TTC Conducted Spurious	TIA/EIA-98-C			SCV Opt9(14400)		
>1.25MHz	3.5.1	< -42dBc	< -42dBc	Max Power Output	1175ch	
>1.98MHz		< -50dBc	< -50dBc	Max Power Output	1175ch	
>2.25MHz		< -13dBm	< -13dBm	Max Power Output	1175ch	