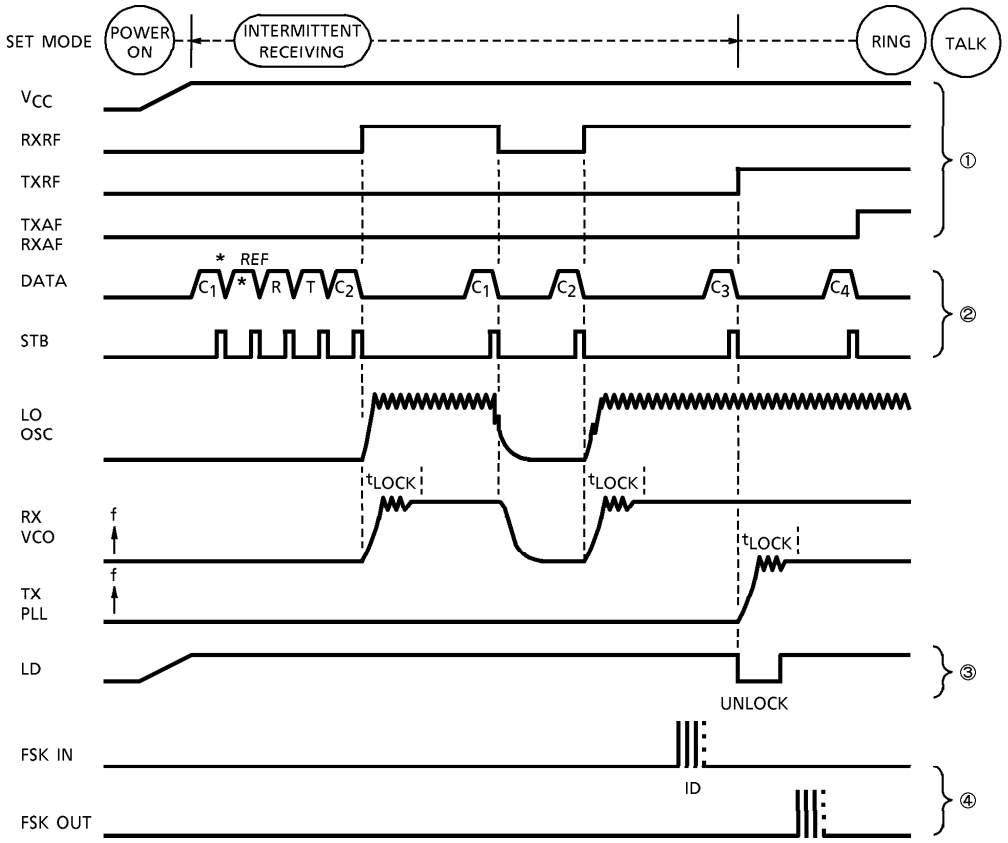
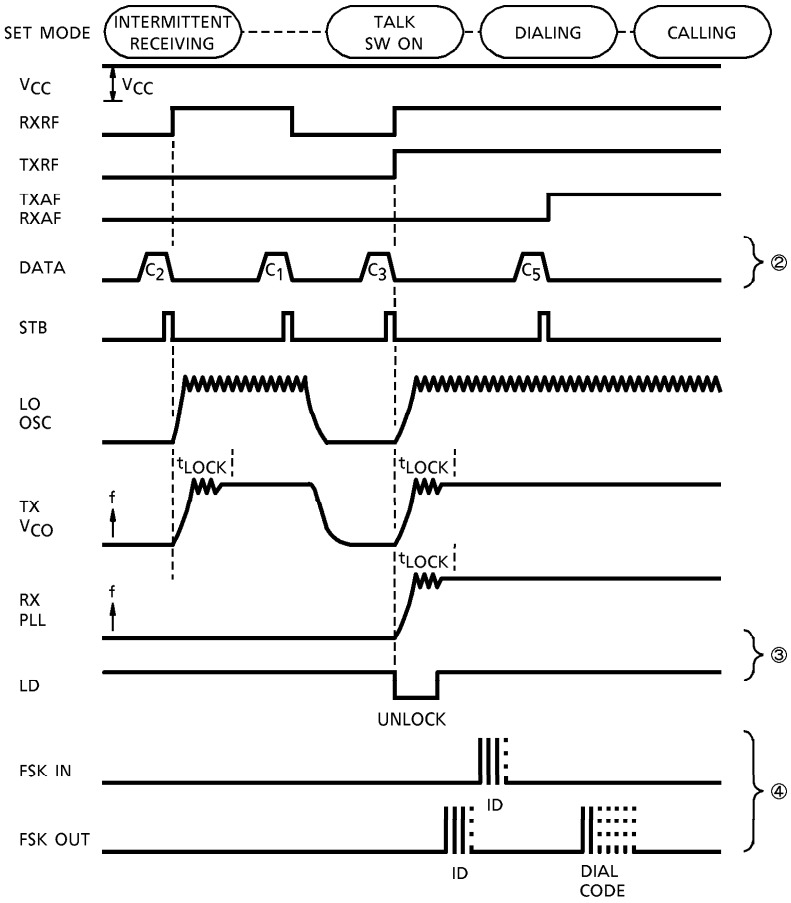
CONTROL TIMING CHART

Receiving



Transmitting



DESCRIPTION FOR CONTROL TIMING

① Stand for internal power supply motion controlled by each bit in CONTROL resister.

② Serial data input. CLK input is omitted in this chart.

REF : REF DIVIDER
R : RX PLL DIVIDER
T : TX PLL DIVIDER
C_1~C_5 : CONTROL

	SIG OUT				TX				RX				BAT		CODE	
C_1	0	0	0	0	1	1	1	1	1	1	1	1	*	*	0	0
C_2	0	0	0	0	1	1	1	1	0	1	1	1	*	*	0	0
C_3	0	0	0	0	0	1	1	1	0	1	1	1	*	*	0	0
C_4	0	0	0	0	0	0	1	0	0	0	1	0	*	*	0	0
C_5	0	0	0	0	0	1	1	1	0	0	1	0	*	*	0	0

Symble * means to be set by user according to battery.

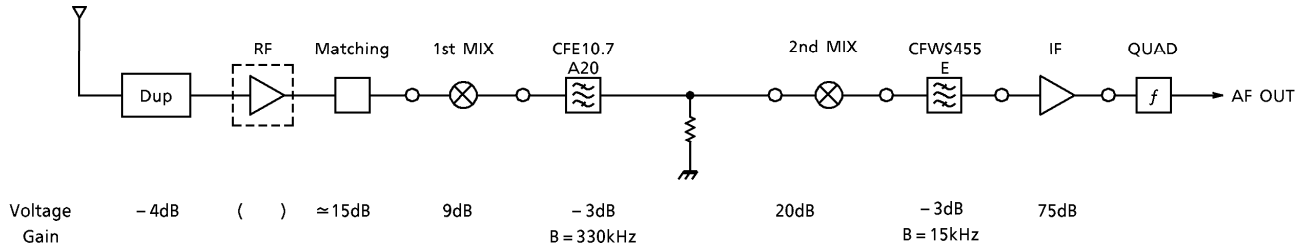
③ LD output

LOCK DETECTOR outputs L level when phase detector is unlock.

④ FSK IN, FSK OUT

FSK IN is not terminal in this IC, which is normally input to TX-VCO.
FSK OUT stands for output of DATA COMP.

GAIN DISTRIBUTION FOR RECEIVING



MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	6	V
Power Dissipation	P_D	890	mW
Operating Temperature	T_{opr}	− 20~70	°C
Storage Temperature	T_{stg}	− 55~150	°C

ELECTRICAL CHARACTERISTICS
TOTAL (Unless Otherwise Specified, V_{CC} = 3.6V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Power Supply Voltage	$V_{CC\,(opr.)}$	—	—	2.0	3.6	6.0	V
Consumption Current 1	I_{CC1}	1	ALL ON	7.5	12.5	19.5	mA
Consumption Current 2	I_{CC2}	1	RX-RF ON	5.8	7.5	12.3	mA
Consumption Current 3	I_{CC3}	1	RX-AF ON	2.0	2.5	4.7	mA
Consumption Current 4	I_{CC4}	1	TX-RF ON	0.8	1.7	3.5	mA
Consumption Current 5	I_{CC5}	1	TX-AF ON	1.0	2.0	3.1	mA
Alarm Supply Current	$I_{CC\,(A)}$	1	R_L = 100kΩ, V_{BAT-L} = 3.30V MODE	—	200	300	μA
Supply Current At Battery Saving	$I_{CC\,(BS)}$	1	ALL OFF	—	50	100	μA
REF Voltage	V_{REF}	1	—	1.2	1.4	1.7	V
Data Input Threshold	V_{IH}	—	—	0.8 × V_{CC}	V_{CC}	6.0	V
	V_{IL}	—	—	− 0.2	0	0.2 × V_{CC}	V
Data Input Current	I_{IH}	—	$V_{IH} = V_{CC}$	—	0	1	μA
	I_{IL}	—	V_{IL} = GND	—	0	1	μA
CK Input Frequency	f_{CK}	—	—	—	38	1000	kHz

REGULATOR SECTION

Output Voltage	V_{REG}	—	I_{OUT} = 1mA	1.75	2.0	2.30	V
Minimum Load Current	$I_{OUT\,(MIN)}$	1	$V_{OUT} = V_{REG\,(OPEN)} - 0.05V$	1	3	—	mA

DETECTOR SECTION
(Unless Otherwise Specified, V_{CC} = 3.6V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
BATTERY ALARM							
Detection Voltage 1	V_{BAT-L}	1	—	2.13	2.25	2.37	V
	V_{BAT-H}		—	—	2.32	2.44	V
Detection Voltage 2	V_{BAT-L}	1	—	2.85	3.00	3.15	V
	V_{BAT-H}		—	—	3.08	3.23	V
Detection Voltage 3	V_{BAT-L}	1	—	3.10	3.25	3.40	V
	V_{BAT-H}		—	—	3.35	3.50	V
Detection Voltage 4	V_{BAT-L}	1	—	3.15	3.30	3.45	V
	V_{BAT-H}		—	—	3.40	3.55	V
Detection Voltage 5	V_{BAT-L}	1	—	3.30	3.45	3.60	V
	V_{BAT-H}		—	—	3.55	3.70	V
Output Low Level Voltage	V_{OL}	1	I_{SINK} = 0.1mA	—	0.1	0.3	V
Output Leak Current	I_{LEAK}	1	V_{ALM} = 3.6V	—	0	5	μA
DATA COMPARATOR							
Minimum Detection Level	V_{TH}	—	f = 500Hz	—	—	50	mV_{rms}
Output Low Level Voltage	V_{OL}	1	I_{SINK} = 0.2mA	—	0.1	0.3	V
Output Leak Current	I_{LEAK}	1	V_{DATA} = 3.6V	—	0	5	μA
SIG OUT DETECTION							
Noise Detection Level	V_{TH-H}	1	—	—	0.5	0.7	V
	V_{TH-L}		—	0.3	0.4	—	V
Noise Detection Level Voltage	V_{OL}	1	I_{SINK} = 0.2mA	—	0.1	0.3	V
Output Leak Current	I_{LEAK}	1	V_{SIG} = 3.6V	—	0	5	μA
RSSI COMPARATOR Detection Voltage	V_{TH-L}	1	COMPARATOR OUTPUT L → H	0.59	0.74	—	V
	V_{TH-H}		COMPARATOR OUTPUT H → L	—	0.8	0.95	V
RSSI COMPARATOR Hysteresis	V_{HYS}	—	—	—	65	—	mV

PLL SECTION
(Unless Otherwise Specified V_{CC} = 3.6V, dBμV = dBμV EMF (OPEN), Ta = 25°C)

Operating Frequency	f_{IN}	1	—	20	43.72	60	MHz
TX-PLL Input Sensitivity	V_{IN}	1	—	93	103	113	dBμV
LOCAL OSCILLATOR Input Sensitivity	V_{LO}	1	f_{LO} = 10.240MHz	104	110	120	dBμV
CHARGE PUMP Output Current	I_{CP1}	—	V_{CP} = 1.8V	—	±200	—	μA
	I_{CP2}		V_{CP} = 1.8V	—	±400	—	μA
CHARGE PUMP Leak Current	I_{LEAK}	1	—	—	0	5	μA
LOCAL OSCILLATOR Operating Frequency	f_{LO}	1	V_{LO} = 112dBμV	9	10.24	12	MHz

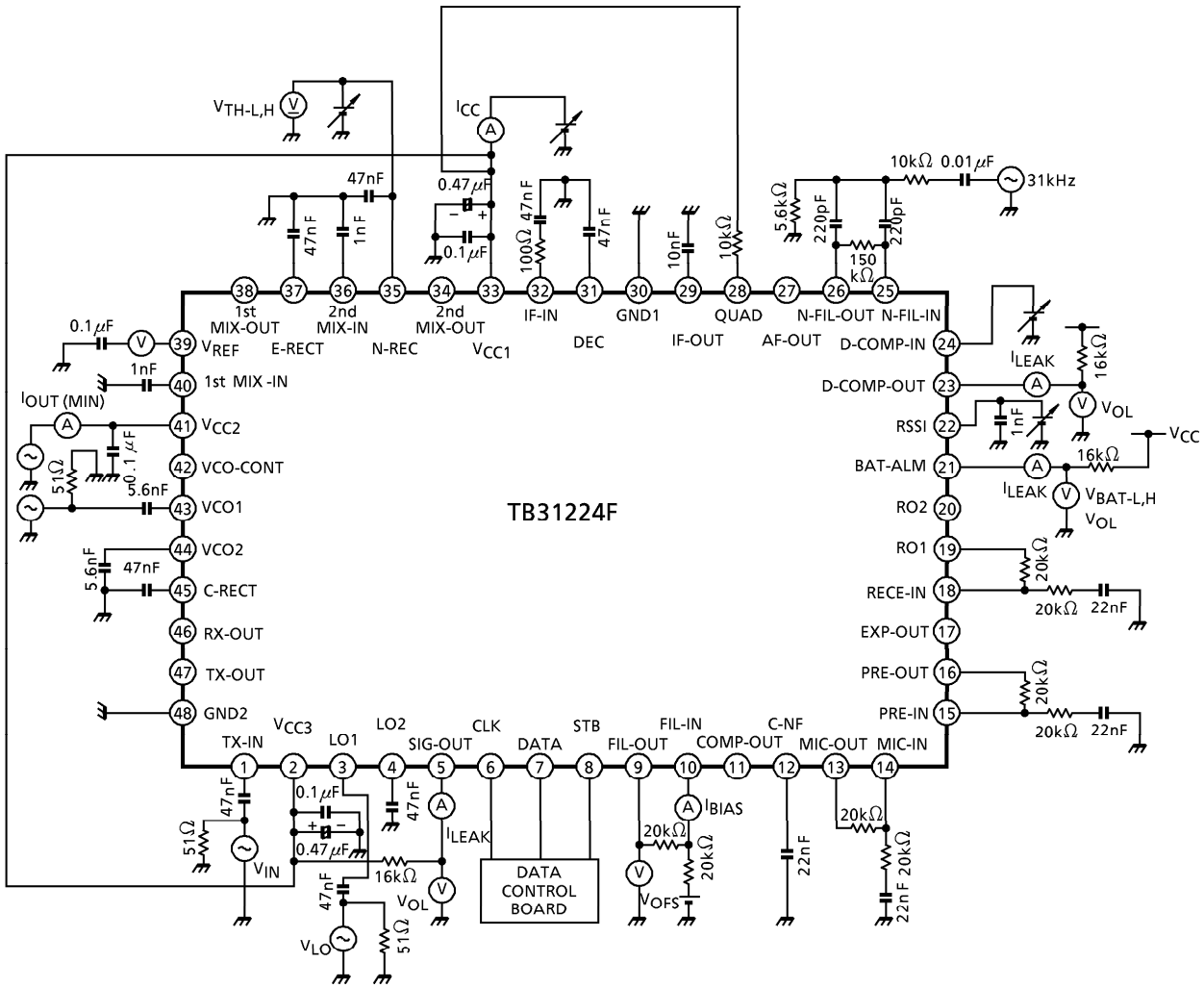
RX-VCO IF + MIX SECTION
(Unless Otherwise Specified, V_{CC} = 3.6V, f_{IN} (MIX1) = 43.72MHz, $f_{IN\ (IF)}$ = 455kHz, Δf = 3.0kHz, f_m = 1kHz, dBμV = dBμV EMF (OPEN), Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
RX-VCO							
Conversion Gain	K_V	—	—	—	2.2	—	MHz / V
RX-VCO Oscillation Level	V_{VCO}	—	f_{VCO} = 25~55MHz At VCO-1~GND	—	110	—	dBμV
1st AND 2nd MIXER, IF AMP							
12dBSINAD Sensitivity	12dBSINAD	—	Input 50Ω	—	20	—	dBμV
MIXER Operating Frequency	f_{MIX1}	—	1st MIXER	20	43.72	60	MHz
	f_{MIX2}		2nd MIXER	—	10.7	20	MHz
Conversion Gain	G_{VC}	2	Excluding Filter Loss	20	26	30	dB
Intercept Point	P_{IM1}	—	1st MIXER	—	107	—	dBμV
IF AMP Gain	G_{IF}	—	—	—	75	—	dB
Demodulated Output	V_{OD}	2	$V_{IN\ (MIX1)}$ = 70dBμV	170	220	270	mV_{rms}
S / N Ratio	S / N	2	$V_{IN\ (MIX1)}$ = 70dBμV	45	55	—	dB
AM Rejection Ratio	AMR	2	$V_{IN\ (MIX1)}$ = 70dBμV	—	40	—	dB
Input Inpedanse	R_{IN1}	—	1stMIX IN	—	2.2	—	kΩ
	C_{IN1}			—	3.0	—	pF
	R_{IN2}		2ndMIX IN	—	4.5	—	kΩ
	C_{IN2}			—	2.7	—	pF
Input Resistance	R_{IN}	—	IF IN	—	1.5	—	kΩ
Output Resistance	R_{01}	—	1stMIX OUT	—	330	—	Ω
	R_{02}		2ndMIX OUT	—	1.5	—	kΩ
RSSI Output Voltage	V_{RSSI1}	2	$V_{IN\ (MIX1)}$ = 20dBμV	0.60	0.85	1.10	V
	V_{RSSI2}		$V_{IN\ (MIX1)}$ = 60dBμV	1.75	2.20	2.65	V

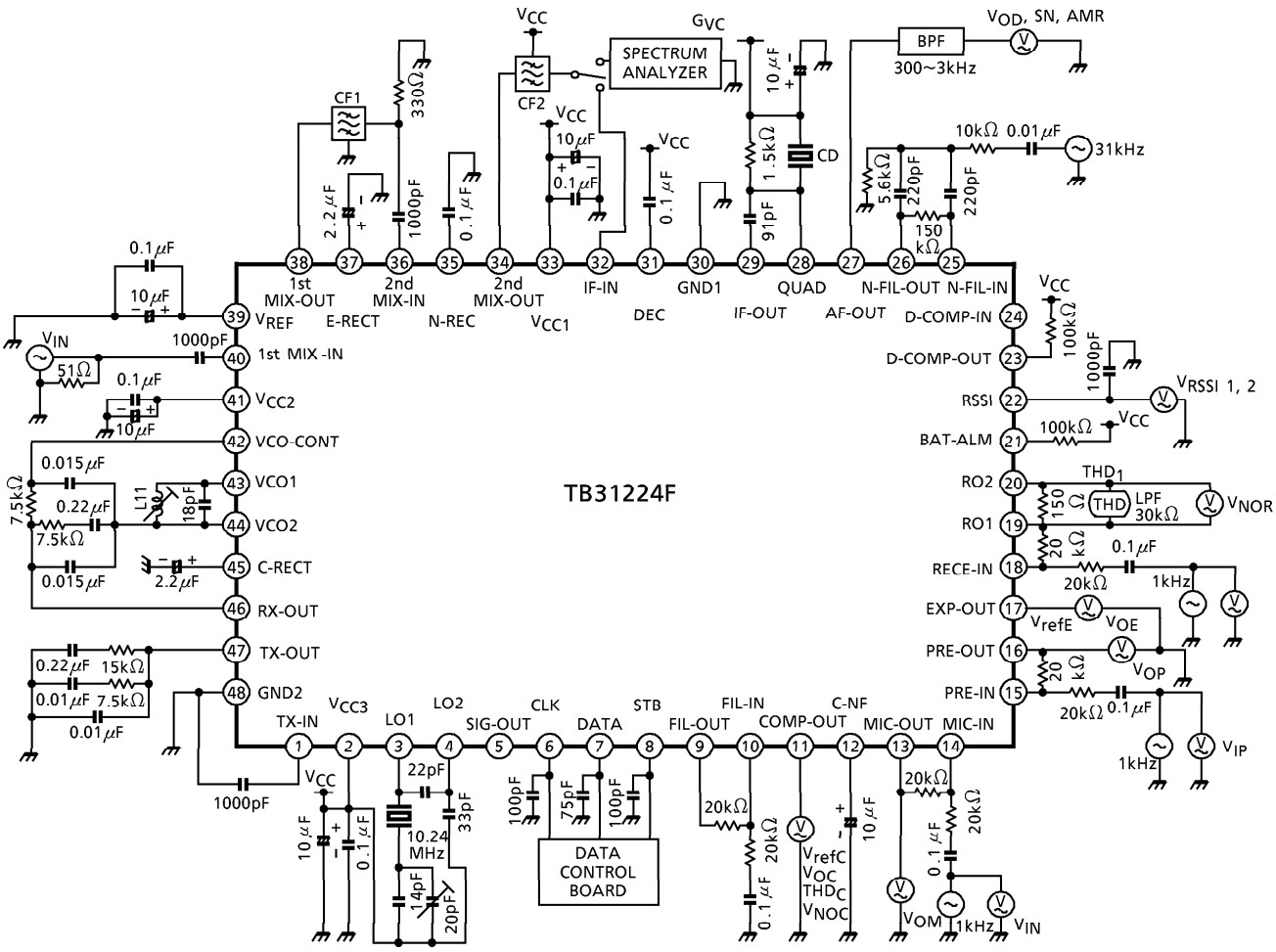
AUDIO SECTION
(Unless Otherwise Specified, V_{CC} = 3.6V, f_{IN} = 1kHz, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
COMPRESSOR + MIC AMP							
Input Reference Level	V_{refC}	2	V_{OM} = − 10dBV	− 12.5	− 10.5	− 8.5	dBV
Output Deviation	V_{OC}	2	V_{OM} = − 30dBV	− 0.7	0	0.7	dB
MIC AMP Voltage Gain	V_4	—	—	—	0	—	dB
Total Hormonic Distortion	THDC	2	V_{OM} = − 10dBV	—	0.3	1	%
Output Noise Level	V_{NOC}	2	Input-GND Short	—	− 61	− 48	dBV
Limitting Level	V_{lim1}	—	COMP OUT, V_{IM} = 0dBV	—	1.3	—	V_{p-p}
	V_{lim2}		MIC OUT, V_{IM} = 0dBV	—	2.6	—	V_{p-p}
MUTE Output Level	V_{MUTE}	—	—	—	− 96	—	dBV
MIC AMP Voltage Gain Setting Range	GR_4	—	—	0	20	30	dB
Crosstalk EC	CT_{EC}	—	V_{IP} = 0dBV	—	− 60	—	dB
Attack Time	T_{AC}	—	V_{IM} = − 46→ − 34dBV	—	3	—	ms
Recovery Time	T_{RC}	—	V_{IM} = − 34→ − 46dBV	—	12	—	ms
EXPANDER + PRE AMP + RECEIVER AMP							
Input Reference Level	V_{refE}	2	V_{OP} = − 10dBV	− 12.8	− 10.0	− 7.2	dBV
Output Deviation	V_{OE}	2	V_{OP} = − 35dBV	− 1.0	0.4	1.8	dB
PRE AMP Voltage Gain	G_{P3}	—	—	—	0	—	dB
RO1 Voltage Gain	G_{RO1}	—	R_L = 150Ω	—	6	—	dB
Total Hormonic Distortion	THD_1	2	R_L = 150Ω V_{RI} = − 15dBV	—	0.7	1.5	%
Output Noise Level	V_{NOR}	2	Input-GND Short	—	− 100	− 88	dBV
Maximum Output Level	DR_R	—	R_L = 150Ω, THD = 3%	—	3.0	—	V_{p-p}
MUTE Output Level	V_{MUTE}	—	—	—	− 75	—	dBV
PRE AMP Voltage Gain Setting Range	G_{RNG2}	—	—	0	—	20	dB
RECEIVER AMP Voltage Gain Setting Range	G_{RNG1}	—	—	6	—	20	dB
Offset Voltage	T_{OF2}	1	RO1-RO2	− 50	0	50	mV
Crosstalk CE	CT_{CE}	—	V_{IM} = − 20dBV	—	− 95	—	dB
Attack Time	T_{AE}	—	V_{IP} = − 18→ − 12dBV	—	15	—	ms
Recovery Time	T_{RE}	—	V_{IP} = − 12→ − 18dBV	—	13	—	ms
FILTER AMP							
Voltage Gain	G_5	—	—	—	0	—	dB
Maximum Output Level	DR_5	—	THD = 3%	—	3	—	V_{p-p}
Input Bias Current	I_{BIAS}	1	—	—	1.5	2.5	μA
Offset Voltage	V_{OF5}	1	—	− 35	0	35	mV

TEST CIRCUIT 1

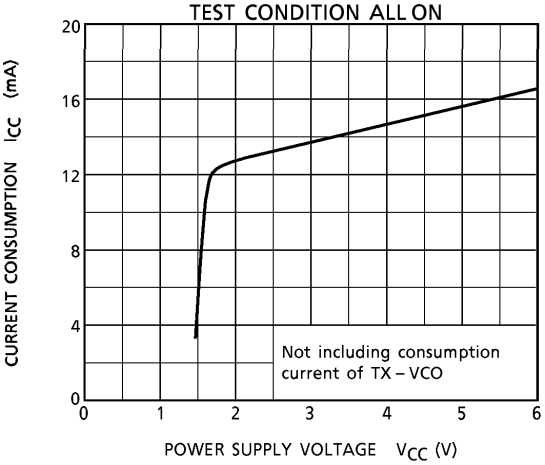


TEST CIRCUIT 2

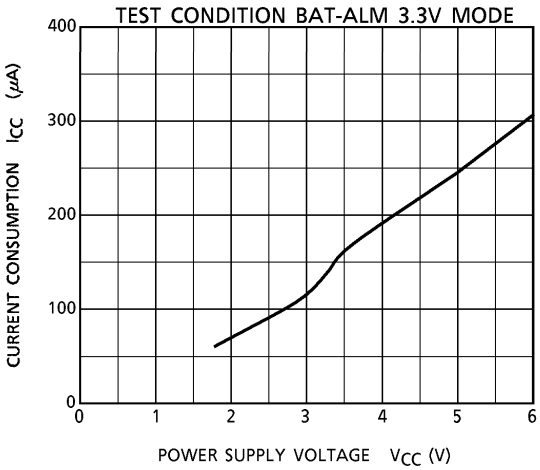


CF1. SFE10.7MA20-A
(MURATA MFG. CO., LTD.)
CF2. CFWS455E
(MURATA MFG. CO., LTD.)
CD. CDBM455C24
(MURATA MFG. CO., LTD.)
L11. 2217-1490
(SUMIDA ELECTRIC CO., LTD.)

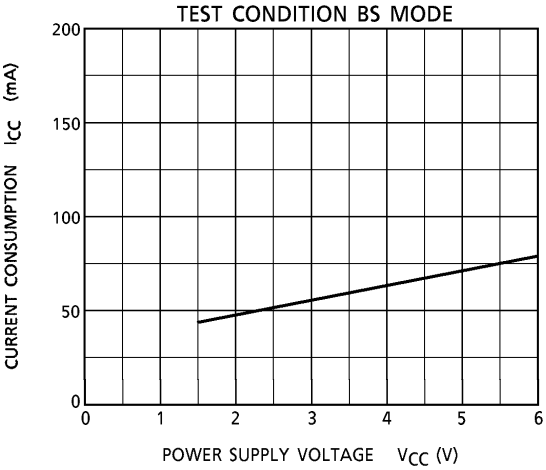
CURRENT CONSUMPTION – POWER SUPPLY VOLTAGE
TEST CONDITION ALL ON



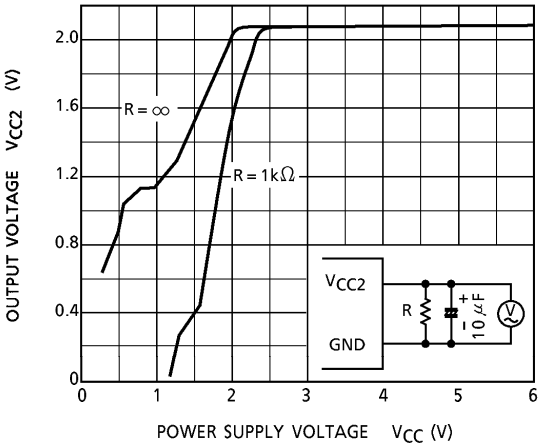
CURRENT CONSUMPTION – POWER SUPPLY VOLTAGE
TEST CONDITION BAT-ALM 3.3V MODE



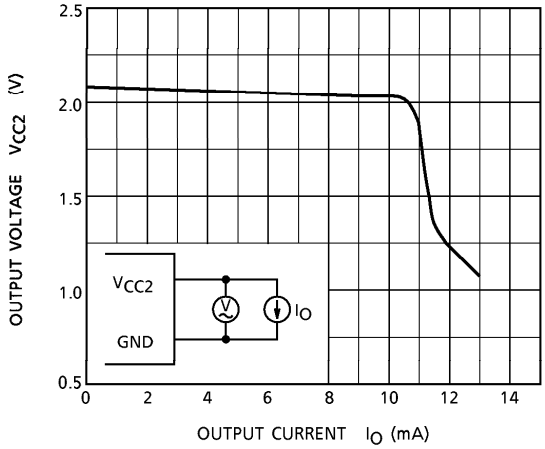
CURRENT CONSUMPTION – POWER SUPPLY VOLTAGE
TEST CONDITION BS MODE

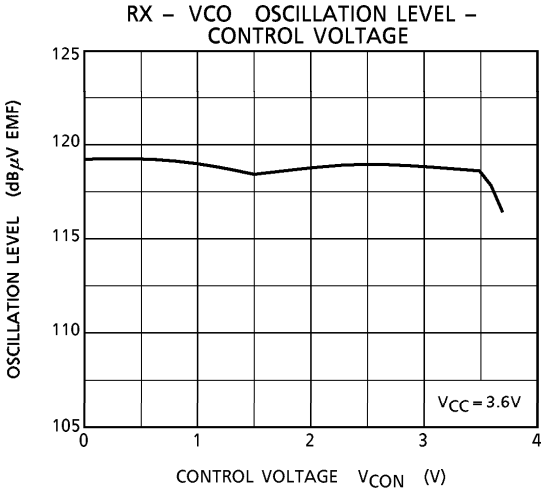


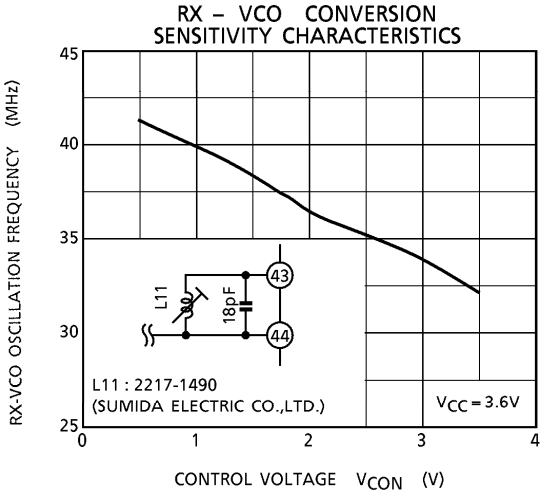
OUTPUT VOLTAGE –
POWER SUPPLY VOLTAGE



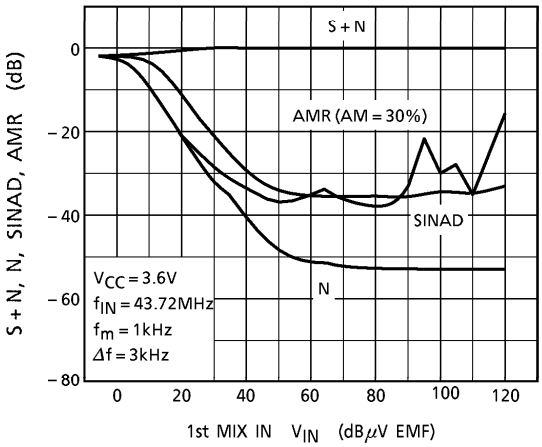
OUTPUT VOLTAGE – OUTPUT CURRENT



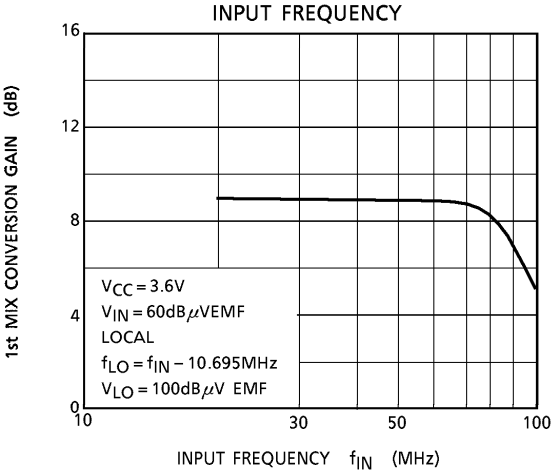

RX – VCO OSCILLATION LEVEL – CONTROL VOLTAGE
OSCILLATION LEVEL (dBμV EMF)
125
120
115
110
105
0
1
2
3
4
VCC = 3.6V
CONTROL VOLTAGE VCON (V)


RX – VCO CONVERSION SENSITIVITY CHARACTERISTICS
RX-VCO OSCILLATION FREQUENCY (MHz)
45
40
35
30
25
0
1
2
3
4
L11
18pF
43
44
L11 : 2217-1490
(SUMIDA ELECTRIC CO.,LTD.)
VCC = 3.6V
CONTROL VOLTAGE VCON (V)

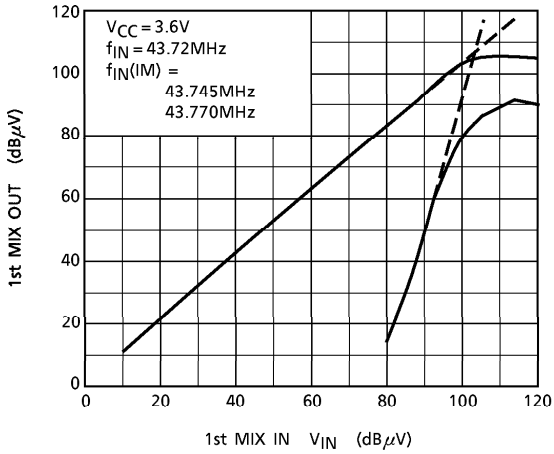
1st MIX + 2nd MIX + IF CHARACTERISTICS (INPUT 50Ω)



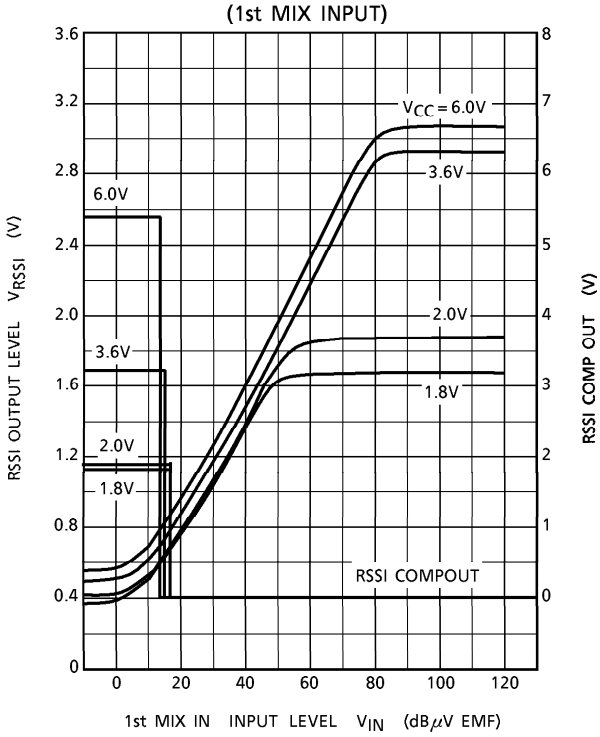
1st MIX CONVERSION GAIN – INPUT FREQUENCY



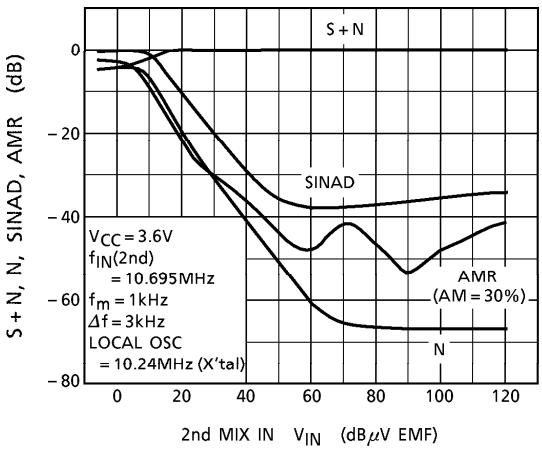
1st MIX INTERCEPT POINT CHARACTERISTICS



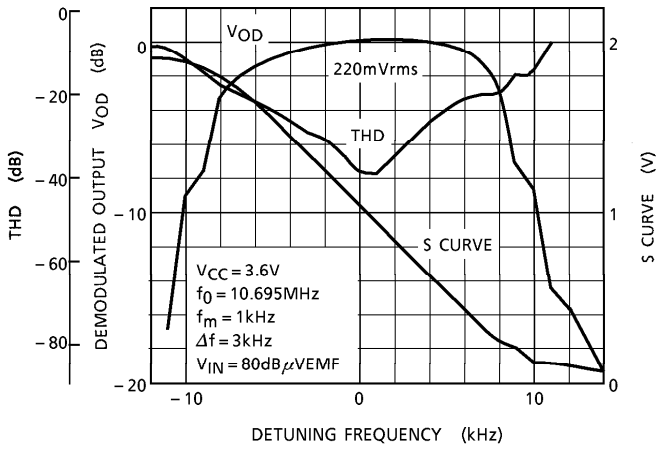
RSSI CHARACTERISTICS (1st MIX INPUT)



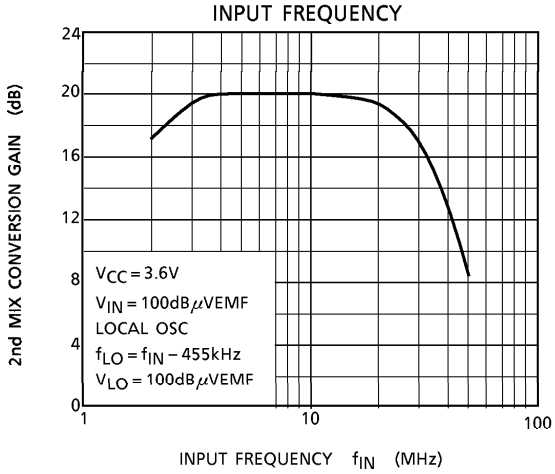
2nd MIX + IF CHARACTERISTICS
(INPUT 50Ω)



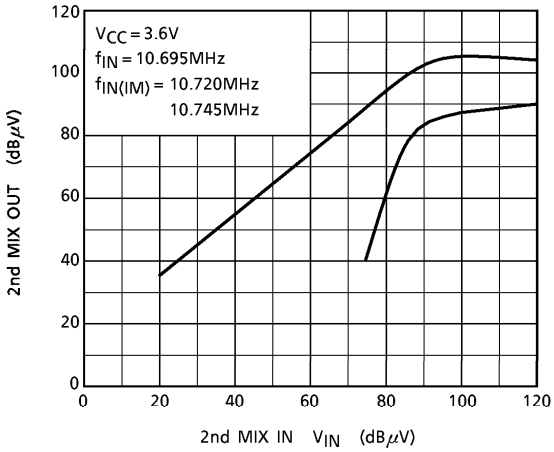
2nd MIX DETUNING CHARACTERISTICS
(INPUT 50Ω)



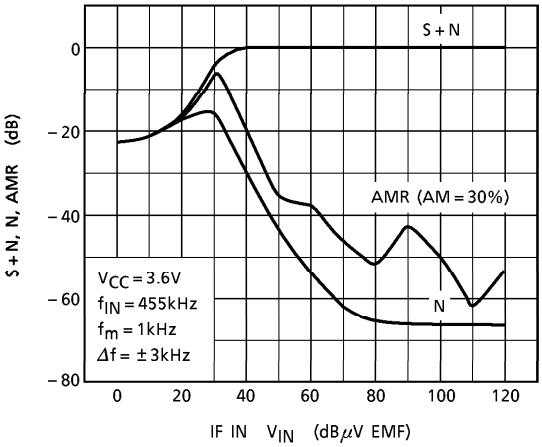
2nd MIX CONVERSION GAIN –
INPUT FREQUENCY



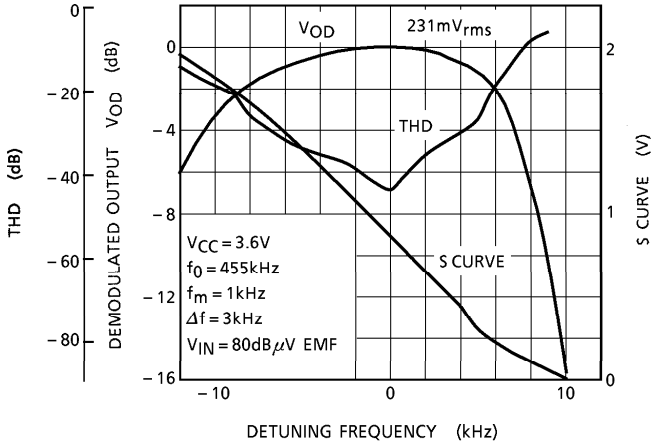
2nd MIX INTERCEPT POINT CHARACTERISTICS



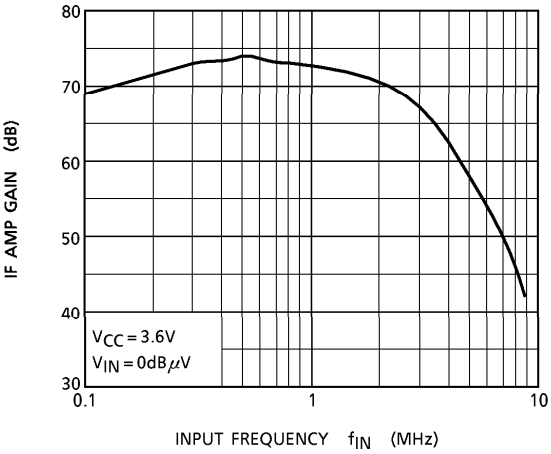
IF AMP CHARACTERISTICS
(INPUT 50Ω)



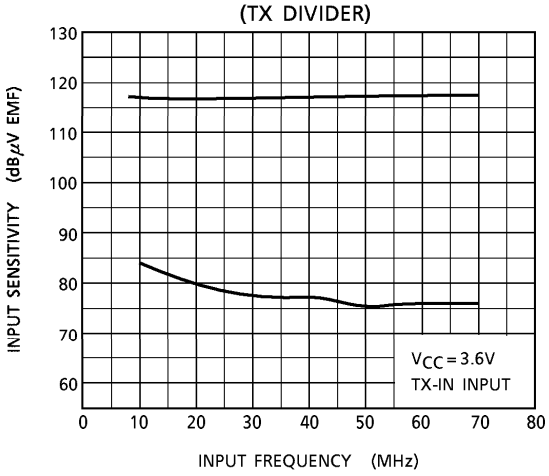
IF AMP DETUNING CHARACTERISTICS
(INPUT 50Ω)



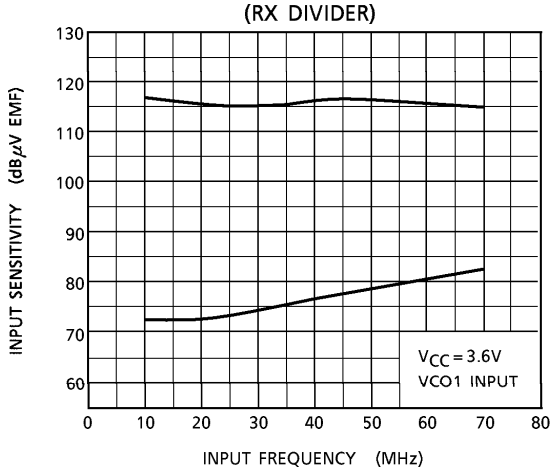
IF AMP GAIN − INPUT FREQUENCY



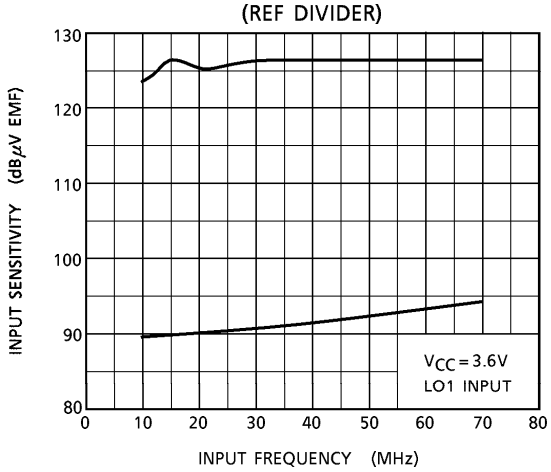
INPUT SENSITIVITY − INPUT FREQUENCY
(TX DIVIDER)



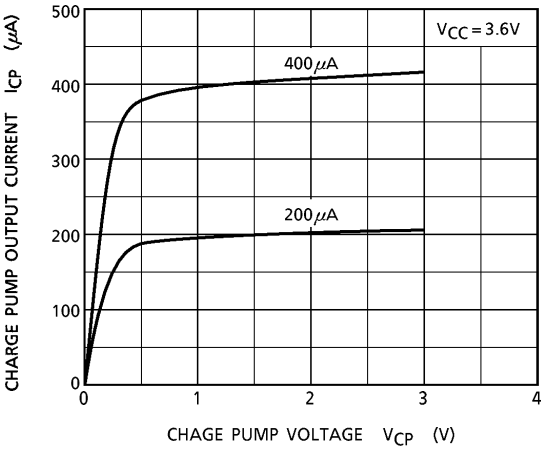
INPUT SENSITIVITY − INPUT FREQUENCY
(RX DIVIDER)



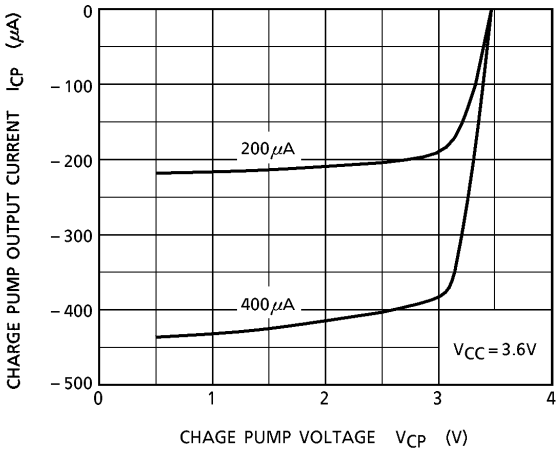
INPUT SENSITIVITY − INPUT FREQUENCY
(REF DIVIDER)



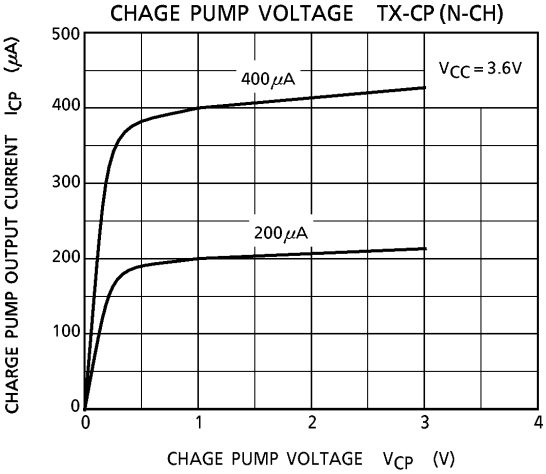
CHARGE PUMP OUTPUT CURRENT –
CHAGE PUMP VOLTAGE RX-CP (N-CH)



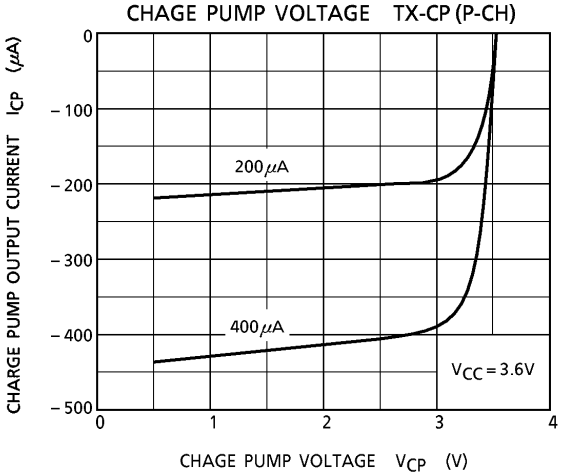
CHARGE PUMP OUTPUT CURRENT –
CHAGE PUMP VOLTAGE RX-CP (P-CH)



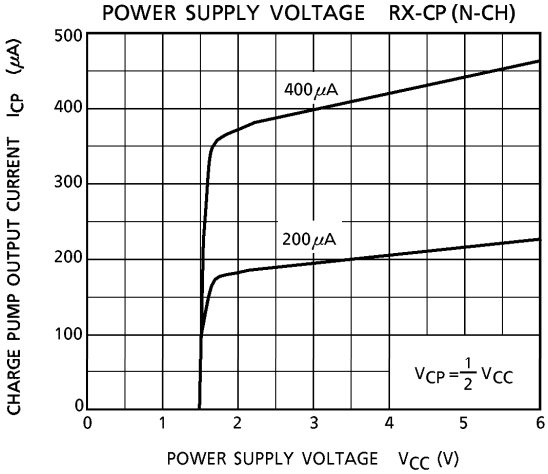
CHARGE PUMP OUTPUT CURRENT –
CHAGE PUMP VOLTAGE TX-CP (N-CH)



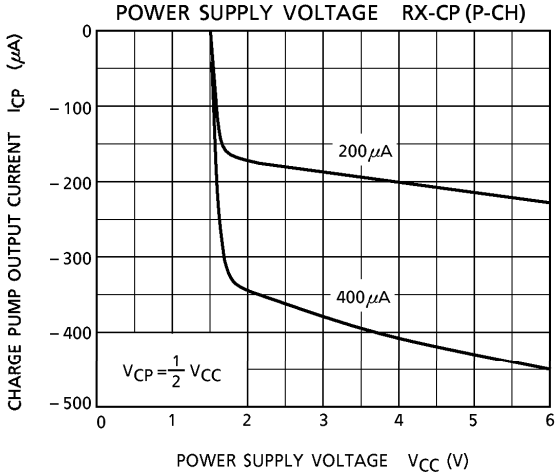
CHARGE PUMP OUTPUT CURRENT –
CHAGE PUMP VOLTAGE TX-CP (P-CH)



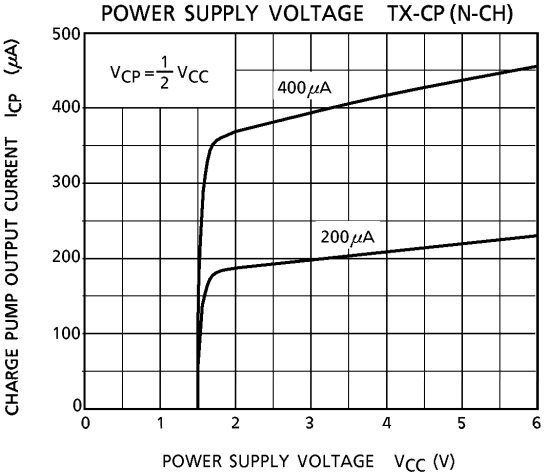
CHARGE PUMP OUTPUT CURRENT –
POWER SUPPLY VOLTAGE RX-CP (N-CH)



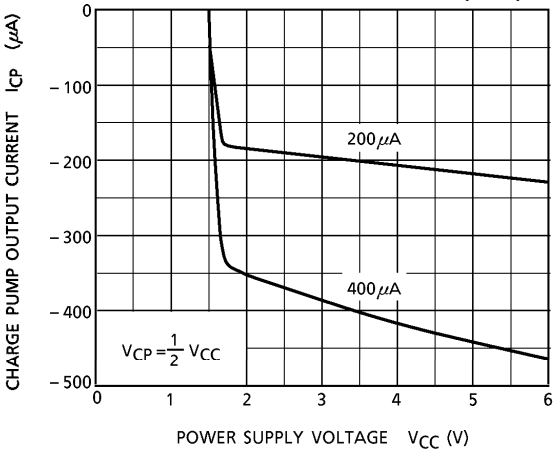
CHARGE PUMP OUTPUT CURRENT –
POWER SUPPLY VOLTAGE RX-CP (P-CH)



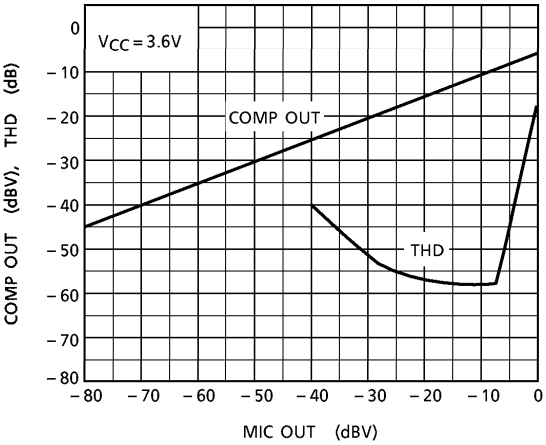
CHARGE PUMP OUTPUT CURRENT – POWER SUPPLY VOLTAGE TX-CP (N-CH)



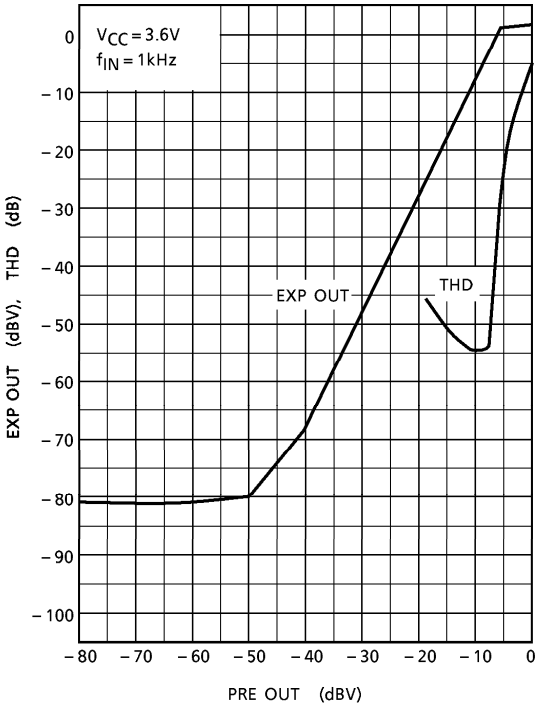
CHARGE PUMP OUTPUT CURRENT – POWER SUPPLY VOLTAGE TX-CP (P-CH)



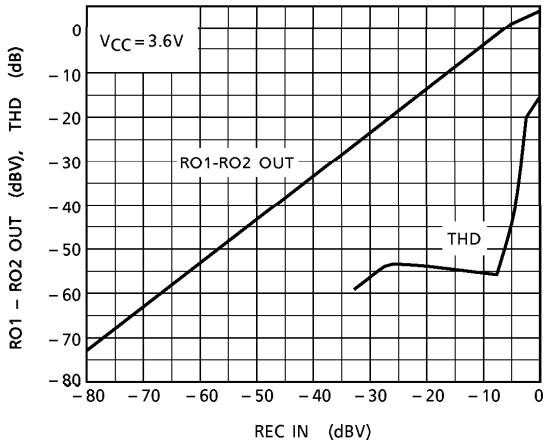
COMPRESSOR CHARACTERISTICS



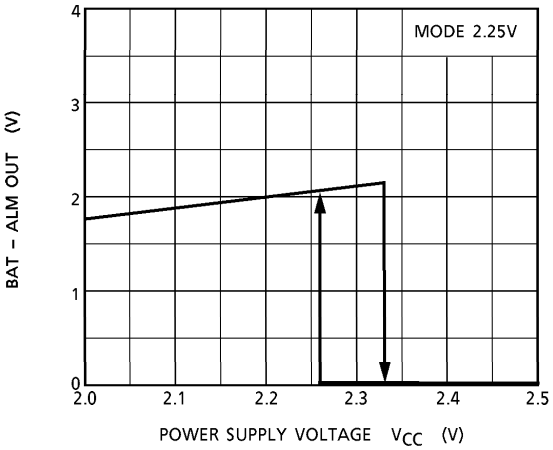
EXPANDER CHARACTERISTICS



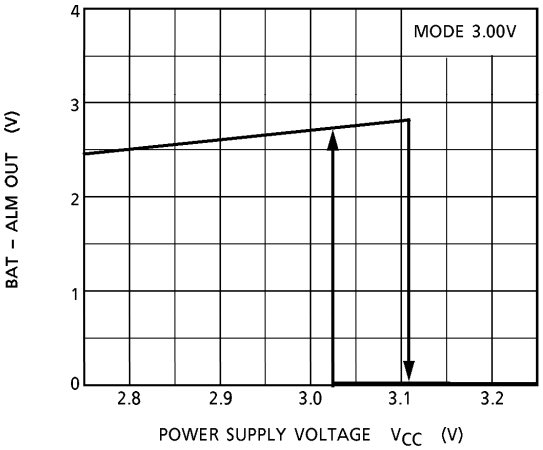
RECEIVER AMP CHARACTERISTICS



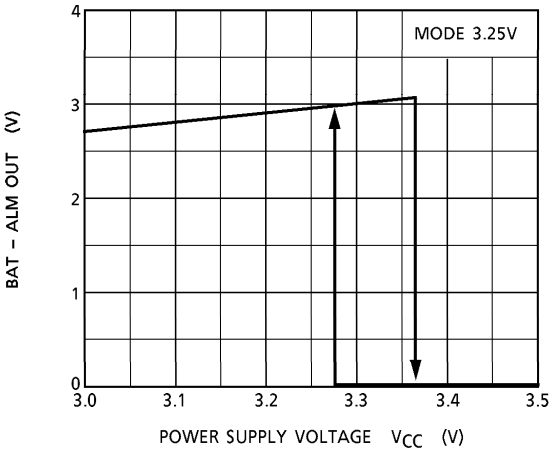
BATTERY ALARM 1 CHARACTERISTICS



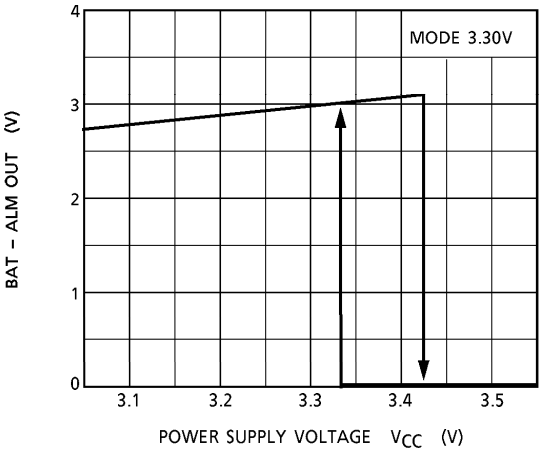
BATTERY ALARM 2 CHARACTERISTICS



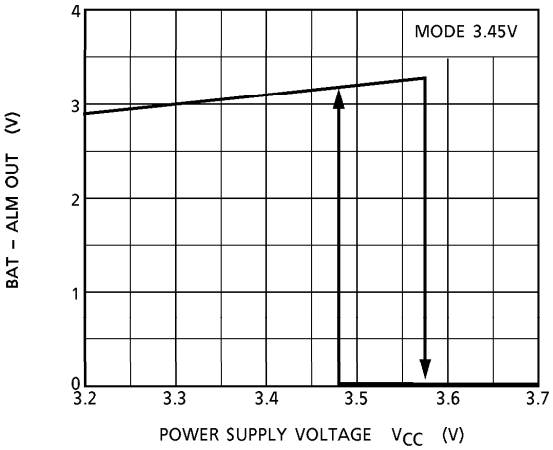
BATTERY ALARM 3 CHARACTERISTICS



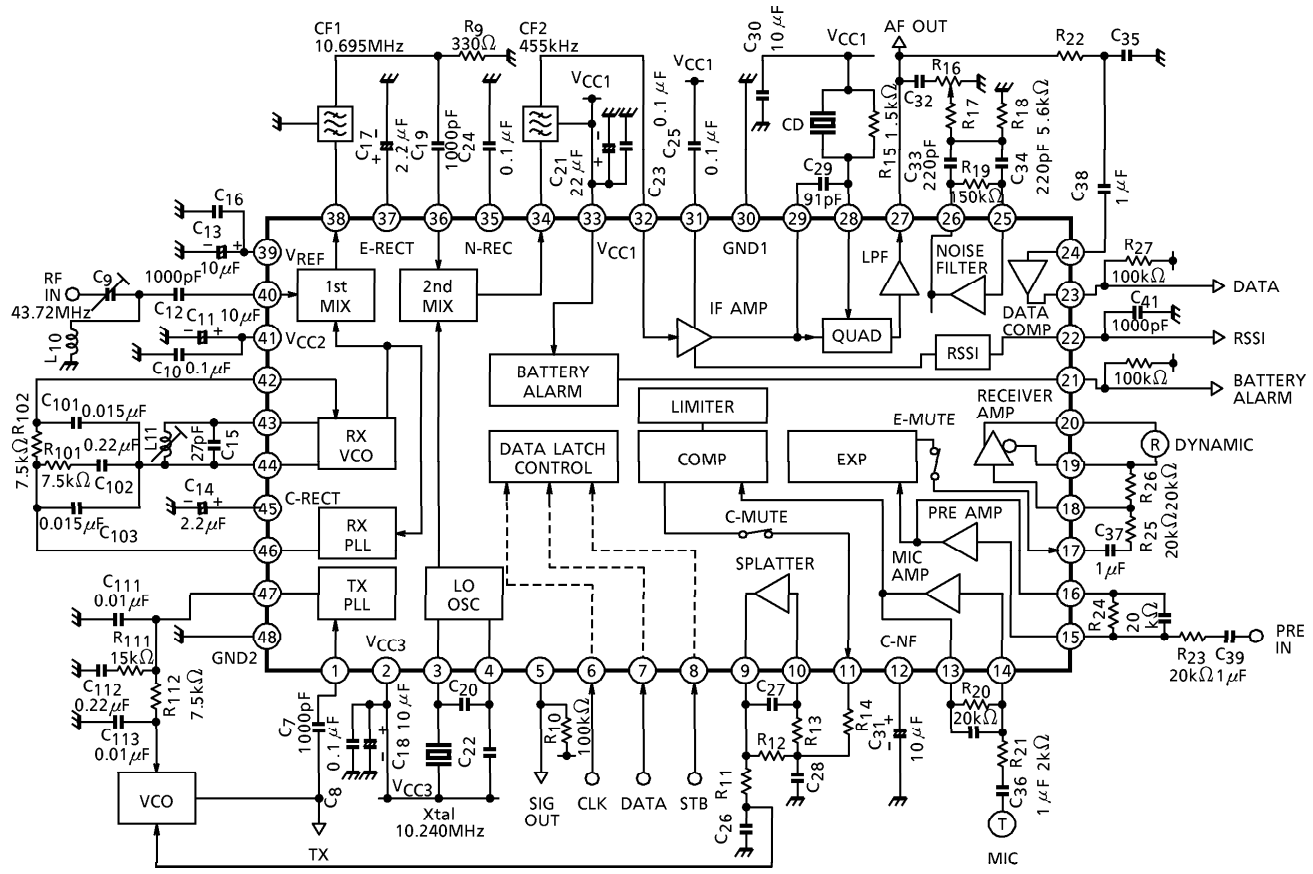
BATTERY ALARM 4 CHARACTERISTICS



BATTERY ALARM 5 CHARACTERISTICS



APPLICATION CIRCUIT

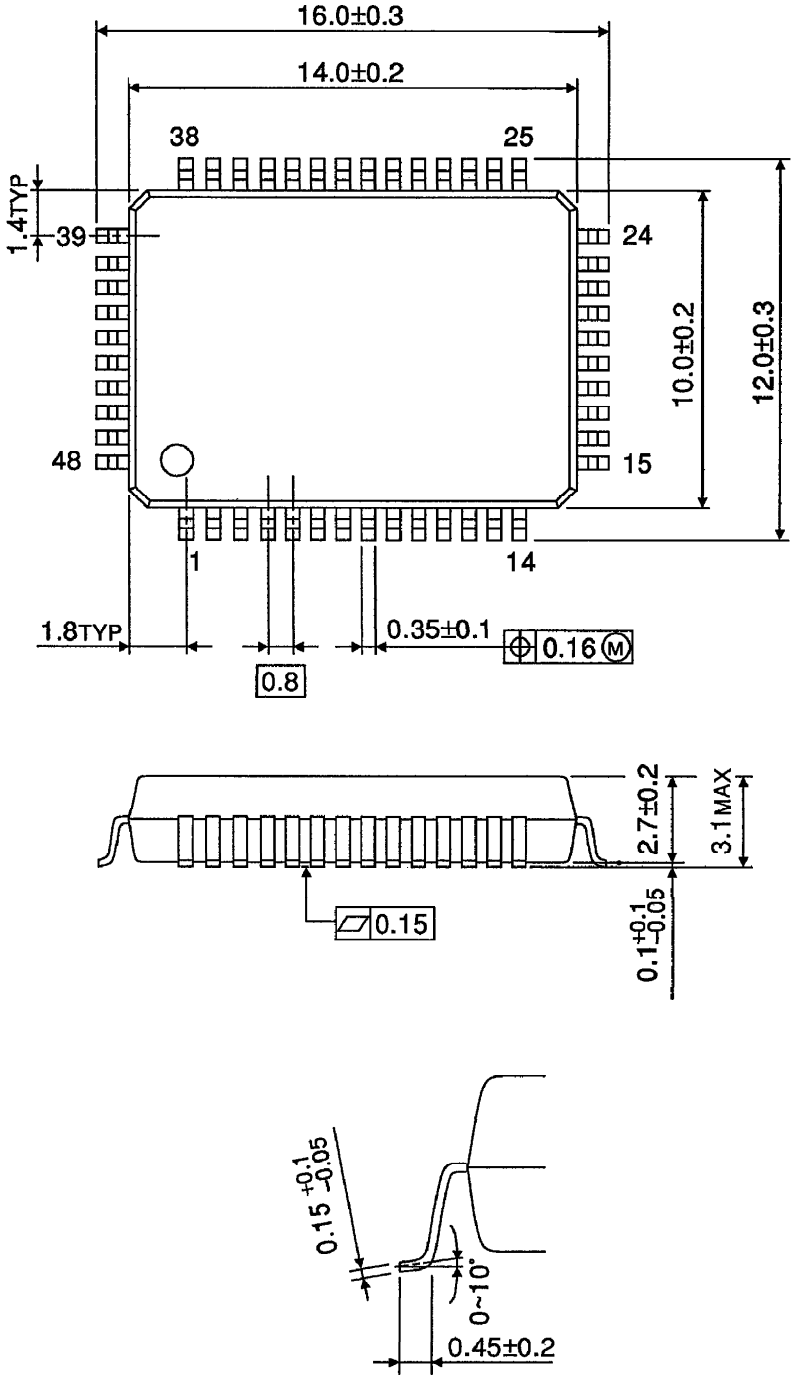


CF1. SFE10.7MA20-A
(MURATA MFG. CO., LTD.)
CF2. CFWS455E
(MURATA MFG. CO., LTD.)
CD. CDBM455C24
(MURATA MFG. CO., LTD.)
L11. 2217-1490
(SUMIDA ELECTRIC CO., LTD.)

OUTLINE DRAWING

QFP48-P-1014-0.80

Unit : mm



Weight : 0.83g (Typ.)