TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

T A 3 1 1 4 5 F N G

FM IF DETECTOR IC FOR PAGER (Built-in 2nd MIX)

FEATURES

- Built-in RSSI function To prevent input overload, RSSI output controls RF attenuator
- Built-in 2nd MIX for double conversion method Mix operating frequency: 10~50MHz
- Built-in low pass filter and waveform shaping circuit enable the extraction of FSK signals from voice signal
- High transmit rate : 1200bps (Typ.)
- Built-in battery-saving function It is possible to reduce load of the battery which is functioning as power supply
- Battery alarm function (ALM) Alarm sensitivity : V_{ALM} = 1.1V (Typ.)
- Constant voltage power supply can be fabricated through externally adding a transistor Output voltage : V_{REG} = 1.0V (Typ.)
- Extremely low current consumption : I_{CC} = 1.2mA (Typ.)
- Power supply voltage : $V_{CC} = 1.1 \sim 3.5V$
- Small package : SSOP20PIN (0.65mm pitch)

BLOCK DIAGRAM



The TA31145FNG package is Pb-Free.



TOSHIBA

PIN FUNCTION

PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIPMENT CIRCUIT (RESISTOR AND CAPACITOR ARE TYP. VALUES.		
1	OSC IN	Local oscillator input terminal. In case of oscillating by X'tal, connect to this terminal.			
2	OSC OUT	Local oscillator output terminal. In case of input from external circuit, input to this terminal.			
3	MIX OUT	Mixer output terminal. Output impedance is $2k\Omega$ (Typ.).	$\begin{array}{c} V_{CC} \\ \hline \\ 3 \\ \hline \\ \hline \\ \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\$		
4	Vcc	Power supply terminal.	—		
5	IF IN	IF amp input terminal (pin 5) and bias decoupling terminal (pin 6).			
6	DEC	Input impedance is $2k\Omega$ (Typ.).			
8	QUAD	Phase-shift input terminal for FM demodulator. Connect to the discriminator.			
9	AF OUT	Output terminal for FM demodulator.			
10	RSSI	RSSI output terminal.			
13	BS	Battery-saving control terminal. "H" Battery-saving OFF state "L" Battery-saving state			

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PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIPMENT CIRCUIT (RESISTOR AND CAPACITOR ARE TYP. VALUES.)
11	LPF IN	LPF input terminal. Bias is supplied from pin 9 through external resistor.	
12	LPF OUT	LPF output terminal. This output is composed by operation amplifier.	
7	FSK REF	Reference input terminal of differential amplifier which is waveform shaping section. Connect a capacitor externally. By the quick charge/discharge circuit of push-pull output, potentials of pin 7 and pin 12 can be made equal.	
15	FSK OUT	Output terminal for waveform shaping. FSK signal, which is input from LPF OUT (pin 12) and of which waveform is shaped, is output as inverted signal. Connect a pull-up resistor, because it is open collector output.	
14	CHARGE	Control terminal for quick charge/discharge circuit. "H" Quick charge/discharge ON "L" Quick charge/discharge OFF	(1) 300kΩ
16	ALM	Output terminal for ALARM. At $V_{CC} \approx 1.1V$, this terminal output becomes "H" ($\approx V_{CC}$) and can indicate deterioration of battery. Connect pull-up resistor, because it is open- collector output.	
17	REG CONT	External transistor for terminal for regulator of external power supply. Connect the PNP transistor externally.	
18	REG OUT	Output voltage monitoring terminal for regulator of external power supply.	
19	GND	GND Terminal.	—
20	MIX IN	Input terminal for MIX. section. Input impedance is $5k\Omega$ (Typ.).	

FUNCTIONS

1. Battery-saving function

Since the battery-saving function is built-in, this IC can minimize the consumption of battery by means of reducing the current consumption by the battery-saving function when the battery is used as the power supply of the set.

As the BS terminal (pin 13) is base of the NPN transistor, its input impedance is high and it can be driven with low power. Therefore, this function can be directly driven by CMOS output of microcomputer.

BS TERMINAL (PIN 13) STATE	BATTERY-SAVING FUNCTION		QUIESCENT CURRENT CONSUMPTION OF IC
L	Battery-saving ON	Operation stop	0μА (Тур.)
Н	Battery-saving OFF	Normal operation	1.2mA (Typ.)

2. Waveform shaping circuit

The FM detected signal is converted into digital signal by the waveform shaping circuit (configured with comparator). Thus, accurate signal digitization can be achieved when this IC is in a weak electric field or there is noise in the FSK signal. Therefore reading errors of the microcomputer are reduced.

The waveform shaping circuit of this IC uses the time constant of the capacitor connected to the FSK REF terminal (pin 7) and the internal resistance to integrate the FM detected signal. The resulting voltage is used as the reference (threshold) voltage to shape the waveform and output the waveform-shaped signal from the FSK OUT terminal (pin 15)

3. Quick charge/discharge circuit

When operation state turn to the battery-saving OFF state (Normal operation state) from the battery-saving state, if the FSK signal is input, the time that the FSK REF terminal (pin 7) arrives at the reference voltage is delayed by the time constant determined by the capacitor connected to the FSK REF terminal (pin 7) and the internal resistance.

In this case, sometimes the erroneous waveform-shaping signal is output because of the error of the input voltage of the waveform shaping circuit (comparator).

In such a case, by means of charging or discharging quickly the capacitor connected to the FSK REF terminal (pin 7) by the quick charge/discharge circuit, the time that the FSK REF terminal (pin 7) becomes the same potential as that of the LPF OUT terminal (pin 12) is shortened, and the FSK output of the erroneous waveform shaping signal is prevented.

- * When CHARGE terminal (pin 14) is at "H", the quick charge/discharge circuit becomes active state.
- 4. Alarm function

In case the battery is used as the power supply of the set, when the power supply voltage is reduced and the voltage of the V_{CC} terminal (pin 4) becomes approximately. 1.1V, the output of the ALM terminal (pin 16) rises up to approximately. 1.1V (\simeq V_{CC}) and the consumption of the battery power can be detected.

5. Constant voltage regulator for power supply of external part

As shown in the following diagram, connecting the PNP transistor to the REG CONT terminal (pin 17) allows the REG OUT terminal (pin 18) to be used for high-output constant voltage : $V_{REG} = 1.0V$ (Typ.). During battery-saving, the constant voltage output is OFF.



When connecting an external resistor "R" to the REG OUT terminal (pin 18) to raise the output voltage, oscillation may occur in the regulator output. To avoid this, connect a capacitor "C" as shown in the following diagram.



6. Local oscillation circuit

Local oscillation circuit is Colpitts type oscillator composed by internal emitter follower circuit and external X'tal. Connect as shown in the figure below.

Connect a base bias resister between pin 1 and V_{CC} or REG OUT terminal (pin 18).

In case of need to increase the current of local oscillation circuit in order to compose the overtone oscillation and improve the stability of oscillation, connect a resistor between pin 2 and GND. In such a case we recommend connecting a base bias resister between pin 1 and pin 18, or the external regulator (is under the control of the battery-saving). (If a base bias resister is connected between pin 1 and V_{CC}, the current flows across a resistor connected between pin 2 and GND during battery saving.)



7. RSSI function

The RSSI terminal (pin10) outputs a DC potential corresponding to the IF IN terminal (pin5) input level. As the RSSI output is converted into voltage by an internal resistance ($82k\Omega$), its characteristics can be changed as shown in the following diagram. In this case, note that owing to displacement of temperature coefficient between external resistance and internal resistance, the temperature characteristics of the RSSI output may change. Because of the internal circuit structure, do not connect the RSSI terminal (pin10) directly to GND.



MAXIMUM RATINGS ($Ta = 25^{\circ}C$)

CHARACTERISTIC	SYMBOL	RATING	UNIT	
Power Supply Voltage	Vcc	4	V	
Power Dissipation	PD	710	mW	
Operating Temperature	T _{opr}	- 30~85	°C	
Storage Temperature	T _{stg}	- 55~150	°C	

ELECTRICAL CHARACTERISTICS

 $Ta = 25^{\circ}C$ Unless otherwise specified, V_{CC} = 1.4V, f_{in} (MIX) = 21.7MHz, f_{in} (IF) = 455kHz, Dev = ± 4kHz, f_m = 600Hz

AM Rejection RatioAMR1 (2) V_{IN} (IF) = 60dB μ V EMF, AM = 30%50dBFSK Output Duty RatioDR1 (4) V_{IN} (IF) = 60dB μ V EMF405060%Alarm Detected VoltageVALM1 (5)1.051.11.15V"L" Level Output Voltage (ALM)VALM L1 (6)I = 100 μ A0.4V"H" Level Leak Current (ALM)IALM1 (7)0.4V"L" Level Output Voltage (FSK)VFSK L1 (8)I = 100 μ A0.4V"H" Level Leak Current (FSK)IFSK1 (9)0.4V"H" Level Leak Current (FSK)IFSK1 (9)2 μ AConstant Voltage OutputVREG1 (10)RL = 430\Omega0.951.01.05VRSSI Output VoltageVRSSI1 (12)VIN (IF) = 65dB μ V EMF0.450.60.80VRSSI Output ResistanceRRSSI82-k\OmegaQuick Charge / Discharge CurrentICH4V7 = 0V, V12 = 0.18V3570110 μ A	<u>\</u>	$Dev = \pm 4k$	(IIZ, I	m = 600HZ		/		
Quiescent Current Consumption ICCQ 2 — — — 1.2 1.7 mA Current Consumption at BS ICCO 3 — — 0 5 μ A Mixer Conversion Gain GMV 1(1) Measured through ceramic filter 9 12.5 16 dB Mixer Intercept Point Ip — — — 9 12.5 16 dB Mixer Output Resistance R (MIX) IN — — — 9 2 — KΩ IF AMP Input Resistance R (IF) IN — — — 2 — KΩ SN Ratio 1 S / N 1 1(3) MIX IN, VIN (MIX) = 60dB μ V EMF — 63 — dB SN Ratio 2 S / N 2 1(2) IF IN, VIN (IF) = 60dB μ V EMF — 63 — dB Limiting Sensitivity 1 VI (LIM) 1 1(3) MIX IN — 14 — dB μ V EM VI (LIM) 2 1(2)	CHARACTERISTIC	SYMBOL	CIR-		MIN.	TYP.	MAX.	UNIT
Current Consumption at BS ICCO 3 — — — 0 5 μ A Mixer Intercept Point Ip — — — 9 12.5 16 dB Mixer Intercept Point Ip — — — 97 — dB μ/V Mixer Intercept Point Ip — — — 97 — dB μ/V Mixer Intercept Point Ip — — — — 97 — dB μ/V Mixer Intercept Point Ip — — — — 97 — dB μ/V Mixer Intercept Point Ip — — — — — 63 — kΩ Mixer Intercept Point S/N 1 1(3) MIX IN, — — 63 — dB SN Ratio 2 S/N 2 1(2) IF IN, — 35 — dB Limiting Sensitivity 1 VI (LIM) 1 1(3) MIX IN — 14 — dB/V Limiting Sensitivity 2 VI (LIM) 2	Operating Voltage Range	Vcc	—	_	1.1	1.4	3.5	V
Line for the description of an matrix GMV 1(1) Measured through ceramic filter 9 12.5 16 dB Mixer Intercept Point Ip - - 97 - dB/V Mixer Intercept Point Ip - - 97 - dB/V Mixer Input Resistance R (MIX) OUT - - - 5 - kΩ Mixer Output Resistance R (IF) IN - - - 2 - kΩ SN Ratio 1 S/N 1 1(3) MIX IN, VIN (MIX) = 60dB//V EMF - 63 - dB SN Ratio 2 S/N 2 1(2) IF IN, VIN (IF) = 60dB//V EMF - 63 - dB SN Ratio 3 S/N 3 1(2) IF IN, VIN (IF) = 60dB//V EMF - 63 - dB Limiting Sensitivity 1 VI (LIM) 2 1(2) IF IN - 23 27 dB//V EMF Demodulated Output Level VOD 1(2) VIN (IF) = 60dB//V EMF - 50 - dB AM Rejection Ratio AMR 1(2) <t< td=""><td>Quiescent Current Consumption</td><td>lcco</td><td>2</td><td>_</td><td>_</td><td>1.2</td><td>1.7</td><td>mA</td></t<>	Quiescent Current Consumption	lcco	2	_	_	1.2	1.7	mA
Mixer Conversion Gain GMV 1 (1) Measured through ceramic filter 9 12.5 16 dB Mixer Intercept Point Ip - - 97 - dB _A /V Mixer Input Resistance R (MIX) IN - - - 7 dB_A/V Mixer Output Resistance R (MIX) OUT - - - 2 - $k\Omega$ IF AMP Input Resistance R (IF) IN - - - 2 - $k\Omega$ SN Ratio 1 S / N 1 1(3) MIX IN, VIN (MIX) = 60dB//V EMF - 63 - dB SN Ratio 2 S / N 2 1(2) IF IN, VIN (IF) = 60dB//V EMF - 63 - dB SN Ratio 3 S / N 3 1(2) IF IN, VIN (IF) = 25dB//V EMF - 14 - dB/// EMF Limiting Sensitivity 1 VI (LIM) 2 1(2) IF IN - 30 45 65 mVrms AM Rejection Ratio AMR 1(2) VIN (IF) = 60dB//V EMF, AM 30% </td <td>Current Consumption at BS</td> <td></td> <td>3</td> <td>_</td> <td>_</td> <td>0</td> <td>5</td> <td>μA</td>	Current Consumption at BS		3	_	_	0	5	μA
Mixer Input Resistance R (MIX) IN - - - - 5 - kΩ Mixer Output Resistance R (MIX) OUT - - - 2 - kΩ IF AMP Input Resistance R (IF) IN - - - 2 - kΩ SN Ratio 1 S/N 1 1(3) MIX IN, VIN (MIX)= 60dB _µ V EMF - 63 - dB SN Ratio 2 S/N 2 1(2) IF IN, VIN ((IF) = 60dB _µ V EMF - 63 - dB SN Ratio 3 S/N 3 1(2) IF IN, VIN ((IF) = 25dB _µ V EMF - 63 - dB Limiting Sensitivity 1 VI (LIM) 1 1(3) MIX IN - 14 - dB _µ V EMF Limiting Sensitivity 2 VI (LIM) 2 1(2) IF IN - 23 27 dB _µ V EMF Demodulated Output Level VOD 1(2) VIN (IF) = 60dB _µ V EMF 30 45 65 mVrms AM Rejection Ratio AMR 1(2) VIN (IF) = 60dB _µ V EMF 40 50 60 % FSK Outp	Mixer Conversion Gain	GMV	1 (1)	-	9	12.5	16	dB
Mixer Output Resistance R (MIX) OUT - - - 2 - k\Omega IF AMP Input Resistance R (IF) IN - - - 2 - kΩ SN Ratio 1 S/ N 1 1(3) MIX IN, VIN (MIX) = 60dB μ V EMF - 63 - dB SN Ratio 2 S/ N 2 1(2) IF IN, VIN (IF) = 60dB μ V EMF - 63 - dB SN Ratio 3 S/ N 3 1(2) IF IN, VIN (IF) = 25dB μ V EMF - 63 - dB Limiting Sensitivity 1 V1 (LIM) 1 1(3) MIX IN - 14 - dB μ V EMF Limiting Sensitivity 2 V1 (LIM) 2 1(2) IF IN - 23 27 dB μ V EMF Demodulated Output Level VOD 1(2) VIN (IF) = 60dB μ V EMF 30 45 65 mVrms AM Rejection Ratio AMR 1(2) VIN (IF) = 60dB μ V EMF - 50 - dB FSK Output Duty Ratio DR 1(4) VIN (IF) = 60dB μ V EMF 40 50 60 % Alarm	Mixer Intercept Point	IP	—	_	—	97	—	$dB\muV$
IF AMP input Resistance R (IF) IN - - - 2 - k Ω SN Ratio 1 S/N 1 1(3) MIX IN, VIN (MIX) = 60dB/2V EMF - 63 - dB SN Ratio 2 S/N 2 1(2) IF IN, VIN (IF) = 60dB/2V EMF - 63 - dB SN Ratio 3 S/N 3 1(2) IF IN, VIN (IF) = 25dB/2V EMF - 63 - dB/2V Limiting Sensitivity 1 VI (LIM) 1 1(3) MIX IN - 14 - dB/2V Limiting Sensitivity 2 VI (LIM) 2 1(2) IF IN - 23 27 dB/2V Demodulated Output Level VOD 1(2) VIN (IF) = 60dB/2V EMF 30 45 65 mVrms AM Rejection Ratio AMR 1(2) VIN (IF) = 60dB/2V EMF 40 50 60 % Alarm Detected Voltage VALM 1(5) - 1.05 1.1 1.15 V "L" Level Output Voltage (ALM) VALM 1(6) I= 100/4A - - 0.4 V "H" Level Leak Curre	Mixer Input Resistance	R (MIX) IN	—	_	_	5	_	kΩ
SN Ratio 1 S/N 1 1 (3) MIX IN, VIN (MIX) = 60dB//V EMF 63 dB SN Ratio 2 S/N 2 1 (2) IF IN, VIN (IF) = 60dB//V EMF 63 dB SN Ratio 3 S/N 3 1 (2) IF IN, VIN (IF) = 25dB//V EMF 63 dB SN Ratio 3 S/N 3 1 (2) IF IN, VIN (IF) = 25dB//V EMF 63 dB/// BB/// EMF Limiting Sensitivity 1 VI (LIM) 1 1 (3) MIX IN 14 dB/// EMF Limiting Sensitivity 2 VI (LIM) 2 1 (2) IF IN 23 27 dB/// EMF Demodulated Output Level VOD 1 (2) VIN (IF) = 60dB//V EMF 30 45 65 mVrms AM Rejection Ratio AMR 1 (2) VIN (IF) = 60dB//V EMF 40 50 60 % Alarm Detected Voltage VALM 1 (5) 1.05 1.1 1.15 V "L" Level Output Voltage (ALM) VALM 1 (6) I=100//A 0.4 V<	Mixer Output Resistance	R (MIX) OUT	_	_	—	2	_	kΩ
SN Ratio 1 S/N 1 1 (3) $V_{IN (MIX)} = 60dB_{\mu}V EMF$ 63 dB SN Ratio 2 S/N 2 1(2) IF IN, VIN (IF) = 60dB_{\mu}V EMF 63 dB SN Ratio 3 S/N 3 1(2) IF IN, VIN (IF) = 25dB_{\mu}V EMF 63 dB Limiting Sensitivity 1 VI (LIM) 1 1(3) MIX IN 14 dB_{\mu}V Limiting Sensitivity 2 VI (LIM) 2 1(2) IF IN 23 22 dB_{\mu}V Demodulated Output Level VOD 1(2) VIN (IF) = 60dB_{\mu}V EMF 30 45 65 mVrms AM Rejection Ratio AMR 1(2) VIN (IF) = 60dB_{\mu}V EMF, AM = 30% 50 dB F5K Output Duty Ratio DR 1(4) VIN (IF) = 60dB_{\mu}V EMF 40 50 60 % Alar Detected Voltage VALM 1(5) 1.05 1.1 1.15 V "I" Level Output Voltage (ALM) VALM 1(6) I= 100_{\mu}A 0.4 V	IF AMP Input Resistance	R (IF) IN	_	_	—	2		kΩ
SN Ratio 2 S/N 2 1 (2) $V_{IN (IF)} = 60dB \mu V EMF$ - 63 - dB SN Ratio 3 S/N 3 1 (2) IF IN, $V_{IN (IF)} = 25dB \mu V EMF$ - 35 - dB Limiting Sensitivity 1 VI (LIM) 1 1 (3) MIX IN - 14 - $dB \mu V$ Limiting Sensitivity 2 VI (LIM) 2 1 (2) IF IN - 23 27 $dB \mu V$ Demodulated Output Level VOD 1 (2) VI N (IF) = 60dB \mu V EMF 30 45 65 mVrms AM Rejection Ratio AMR 1 (2) VIN (IF) = 60dB \mu V EMF, AM = 30% - 50 - dB FSK Output Duty Ratio DR 1 (4) VIN (IF) = 60dB \mu V EMF, AM = 30% - 50 - dB FSK Output Duty Ratio DR 1 (4) VIN (IF) = 60dB \mu V EMF 40 50 60 % rL" Level Output Voltage (ALM) VALM 1 (5) - 1.05 1.1 1.15 V "I" Level Leak Current (ALM) IALM 1 (7) - - 0.4 V	SN Ratio 1	S/N 1	1 (3)		_	63	_	dB
SN Ratio 3 S/N 3 1 (2) V_{N} ((F) = 25dB/ μ V EMF - 35 - dB Limiting Sensitivity 1 VI (LIM) 1 1 (3) MIX IN - 14 - dB/μ V Limiting Sensitivity 2 VI (LIM) 2 1 (2) IF IN - 23 27 dB/μ V Demodulated Output Level VOD 1 (2) IF IN - 23 27 dB/μ V AM Rejection Ratio AMR 1 (2) VIN (IF) = 60dB/ μ V EMF 30 45 65 mVrms FSK Output Duty Ratio DR 1 (4) VIN (IF) = 60dB/ μ V EMF 40 50 60 % Alarm Detected Voltage VALM 1 (5) - 1.05 1.1 1.15 V "L" Level Output Voltage (ALM) VALM 1 (6) I= 100/ μ A - - 0.4 V "H" Level Leak Current (ALM) IALM 1 (7) - - - 0.4 V "H" Level Leak Current (FSK) VFSK L 1 (8) I= 100/ μ A - - 0.4 V "H" Level Lea	SN Ratio 2	S/N 2	1 (2)		_	63		dB
Limiting Sensitivity 1 VI (LIM) 1 1 (3) IVIX IN — 1 4 — EMF Limiting Sensitivity 2 VI (LIM) 2 1 (2) IF IN — 23 27 $\frac{dB_{\mu}V}{EMF}$ Demodulated Output Level VOD 1 (2) VIN (IF) = 60dB_{\mu}V EMF 30 45 65 mVrms AM Rejection Ratio AMR 1 (2) VIN (IF) = 60dB_{\mu}V EMF, AM = 30% — 50 — dB FSK Output Duty Ratio DR 1 (4) VIN (IF) = 60dB_{\mu}V EMF, AM = 30% — 50 60 % Alarn Detected Voltage VALM 1 (5) — 1.05 1.1 1.15 V "L" Level Output Voltage (ALM) VALM 1 (6) I= 100 μ A — — 0.4 V "H" Level Leak Current (ALM) IALM 1 (7) — — — 0.4 V "H" Level Leak Current (FSK) IFSK 1 (8) I= 100 μ A — — 0.4 V "H" Level Leak Current (FSK) IFSK 1 (9) — — — 2 μ A	SN Ratio 3	S / N 3	1 (2)		_	35	_	dB
Limiting Sensitivity 2 VI (LIM) 2 I (2) IF IN — 23 27 EMF Demodulated Output Level VOD 1 (2) VIN (IF) = 60dB μ V EMF 30 45 65 mVrms AM Rejection Ratio AMR 1 (2) VIN (IF) = 60dB μ V EMF, AM = 30% — 50 — dB FSK Output Duty Ratio DR 1 (4) VIN (IF) = 60dB μ V EMF 40 50 60 % Alarm Detected Voltage VALM 1 (5) — 1.05 1.1 1.15 V "L" Level Output Voltage (ALM) VALM 1 (6) I= 100 μ A — — 0.4 V "H" Level Leak Current (ALM) IALM 1 (7) — — — 0.4 V "H" Level Leak Current (FSK) VFSK L 1 (8) I= 100 μ A — — 0.4 V "H" Level Leak Current (FSK) VFSK L 1 (8) I= 100 μ A — — 0.4 V "SI Output Voltage Output VREG 1 (10) RL = 430 \Omega 0.95 1.0 1.05 V	Limiting Sensitivity 1	VI (LIM) 1	1 (3)	MIX IN	_	14		
AM Rejection Ratio AMR $1 (2)$ $V_{IN} (IF) = 60dB \mu V EMF, AM = 30\%$ 50 dB FSK Output Duty Ratio DR $1 (4)$ $V_{IN} (IF) = 60dB \mu V EMF$ 40 50 60 $\%$ Alarm Detected Voltage VALM $1 (5)$ 1.05 1.1 1.15 V "L" Level Output Voltage (ALM) VALM $1 (6)$ $I = 100 \mu A$ 0.4 V "H" Level Leak Current (ALM) $IALM$ $1 (7)$ 0.4 V "L" Level Output Voltage (FSK) VFSK L $1 (8)$ $I = 100 \mu A$ 0.4 V "H" Level Leak Current (FSK) IFSK $1 (9)$ 0.4 V "H" Level Leak Current (FSK) IFSK $1 (9)$ 0.4 V Constant Voltage Output VREG $1 (10)$ $RL = 430\Omega$ 0.95 1.0 1.05 V RSSI Output Voltage VRSSI $1 (12)$ $V_{IN} (IF) = 65dB \mu V EMF$ 0.45 0.6 0.80 V </td <td>Limiting Sensitivity 2</td> <td>VI (LIM) 2</td> <td>1 (2)</td> <td>IF IN</td> <td>_</td> <td>23</td> <td>27</td> <td></td>	Limiting Sensitivity 2	VI (LIM) 2	1 (2)	IF IN	_	23	27	
AMR1 (2) AM = 30% $$ 50 $$ dBFSK Output Duty RatioDR1 (4) V_{IN} (IF) = 60dB μ V EMF405060%Alarm Detected VoltageVALM1 (5) $$ 1.051.11.15V"L" Level Output Voltage (ALM)VALM1 (6)I = 100 μ A $$ $$ 0.4V"H" Level Leak Current (ALM)IALM1 (7) $$ $$ 0.4V"L" Level Output Voltage (FSK)VFSK L1 (8)I = 100 μ A $$ $$ 0.4V"H" Level Leak Current (FSK)VFSK L1 (8)I = 100 μ A $$ $$ 0.4V"H" Level Leak Current (FSK)VFSK L1 (9) $$ $$ 0.4V"H" Level Leak Current (FSK)VFSK1 (10)RL = 430 Ω 0.951.01.05VRSSI Output VoltageVRSSI1 (12)VIN (IF) = 65dB μ V EMF0.450.60.80VRSSI Output ResistanceRRSSI $$ $$ $$ $$ $k\Omega$ Quick Charge / Discharge CurrentICH4 $V_7 = 0V$, $V_{12} = 0.18V$ 3570110 μ A	Demodulated Output Level	VOD	1 (2)	VIN (IF) = 60dBµV EMF	30	45	65	mV _{rms}
Alarm Detected Voltage VALM 1 (5) — 1.05 1.1 1.15 V "L" Level Output Voltage (ALM) VALM 1 (6) $I=100\mu$ A — — 0.4 V "H" Level Leak Current (ALM) IALM 1 (7) — — — 0.4 V "L" Level Output Voltage (FSK) VFSK L 1 (8) $I=100\mu$ A — — 0.4 V "L" Level Output Voltage (FSK) VFSK L 1 (8) $I=100\mu$ A — — 0.4 V "H" Level Leak Current (FSK) IFSK 1 (9) — — — 0.4 V "H" Level Leak Current (FSK) IFSK 1 (9) — — — 0.4 V Constant Voltage Output VREG 1 (10) $RL=430\Omega$ 0.95 1.0 1.05 V RSSI Output Voltage VRSSI 1 (12) $V_{IN (IF)} = 65dB\mu$ V EMF 0.45 0.6 0.80 V RSSI Output Resistance RRSSI — — — — 82 — k\Omega Quick Charge / Discharge Cur	AM Rejection Ratio	AMR	1 (2)		_	50	_	dB
"L" Level Output Voltage (ALM) VALM L 1 (6) I= 100 μ A - - 0.4 V "H" Level Leak Current (ALM) IALM 1 (7) - - - 2 μ A "L" Level Output Voltage (FSK) VFSK L 1 (8) I= 100 μ A - - 0.4 V "H" Level Leak Current (FSK) VFSK L 1 (8) I= 100 μ A - - 0.4 V "H" Level Leak Current (FSK) VFSK L 1 (8) I= 100 μ A - - 0.4 V Constant Voltage Output VFSK 1 (9) - - - 2 μ A RSSI Output Voltage VREG 1 (10) RL= 430 \Omega 0.95 1.0 1.05 V RSSI Output Voltage VRSSI 1 (12) VIN (IF) = 65dB μ V EMF 0.45 0.6 0.80 V RSSI Output Resistance RRSSI - - - - 82 - k\Omega Quick Charge / Discharge Current ICH 4 V7=0V, V12=0.18V 35 70 110 μ A	FSK Output Duty Ratio	DR	1 (4)	VIN (IF) = 60dBµV EMF	40	50	60	%
"L" Level Output Voltage (ALM) VALM L 1 (6) I= 100 μ A - - 0.4 V "H" Level Leak Current (ALM) IALM 1 (7) - - - 2 μ A "L" Level Output Voltage (FSK) VFSK L 1 (8) I= 100 μ A - - 0.4 V "H" Level Leak Current (FSK) VFSK L 1 (8) I= 100 μ A - - 0.4 V "H" Level Leak Current (FSK) VFSK L 1 (8) I= 100 μ A - - 0.4 V Constant Voltage Output VFSK 1 (9) - - - 2 μ A RSSI Output Voltage VREG 1 (10) RL= 430 \Omega 0.95 1.0 1.05 V RSSI Output Voltage VRSSI 1 (12) VIN (IF) = 65dB μ V EMF 0.45 0.6 0.80 V RSSI Output Resistance RRSSI - - - - 82 - k\Omega Quick Charge / Discharge Current ICH 4 V7=0V, V12=0.18V 35 70 110 μ A	Alarm Detected Voltage	VALM	1 (5)		1.05	1.1	1.15	V
"L" Level Output Voltage (FSK) VFSK L 1 (8) I = 100 μ A — — — 0.4 V "H" Level Leak Current (FSK) IFSK 1 (9) — — — 0.4 V Constant Voltage Output VREG 1 (10) RL = 430 \Omega 0.95 1.0 1.05 V RSSI Output Voltage VRSSI 1 (12) VIN (IF) = 65dB μ V EMF 0.45 0.6 0.80 V RSSI Output Resistance RRSSI — — — 82 — kΩ Quick Charge / Discharge Current ICH 4 V7=0V, V12=0.18V 35 70 110 μ A	"L" Level Output Voltage (ALM)		1 (6)	I = 100μA	_	_	0.4	V
"H" Level Leak Current (FSK) IFSK 1 (9) — — — 2 μ A Constant Voltage Output VREG 1 (10) RL = 430 \Omega 0.95 1.0 1.05 V RSSI Output Voltage VRSSI 1 (12) VIN (IF) = 65dB μ V EMF 0.45 0.6 0.80 V RSSI Output Resistance RRSSI — — — — 82 — k\Omega Quick Charge / Discharge Current ICH 4 V7=0V, V12=0.18V 35 70 110 μ A	"H" Level Leak Current (ALM)		1 (7)	_	—	_	2	μA
Constant Voltage Output VREG 1 (10) $R_L = 430\Omega$ 0.95 1.0 1.05 V RSSI Output Voltage VRSSI 1 (12) V_{IN} (IF) = 65dB/ μ V EMF 0.45 0.6 0.80 V RSSI Output Resistance RRSSI 82 $k\Omega$ Quick Charge / Discharge Current ICH 4 $V7 = 0V$, $V_{12} = 0.18V$ 35 70 110 μ A	"L" Level Output Voltage (FSK)	VFSK L	1 (8)	I = 100μA	—	_	0.4	V
RSSI Output Voltage VRSSI 1 (12) $V_{IN (IF)} = 65 dB \mu V EMF$ 0.45 0.6 0.80 V RSSI Output Resistance RRSSI — — — — 82 — $k\Omega$ Quick Charge / Discharge Current ICH 4 $V7 = 0V, V_{12} = 0.18V$ 35 70 110 μA	"H" Level Leak Current (FSK)	IFSK	1 (9)		—	_	2	μA
RSSI Output Voltage VRSSI 1 (12) V _{IN (IF)} = 65dBμ/V EMF 0.45 0.6 0.80 V RSSI Output Resistance RRSSI - - - - 82 - kΩ Quick Charge / Discharge Current ICH 4 V7=0V, V12=0.18V 35 70 110 μA	Constant Voltage Output	VREG	1 (10)	RL = 430Ω	0.95	1.0	1.05	V
Quick Charge / Discharge Current ICH 4 V7 = 0V, V12 = 0.18V 35 70 110 μ A	RSSI Output Voltage		1 (12)	VIN (IF) = 65dBµV EMF	0.45	0.6	0.80	V
	RSSI Output Resistance	RRSSI	—	_	—	82	—	kΩ
"L" Level Output Voltage (REG CONT) REG L 1 (11) I = 100 \u03c0 A 0.6 V	Quick Charge / Discharge Current	ІСН	4	$V_7 = 0V, V_{12} = 0.18V$	35	70	110	μA
	"L" Level Output Voltage (REG CONT)	REG L	1 (11)	I = 100 µA	—	_	0.6	V

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TEST CIRCUIT 1



(1) GM_V





(3) SN1, V_I (LIM) 1



(4) D_R



(5) V_{ALM}

SG



21.01 μF

(6) V_{ALM L}



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120



PACKAGE DIMENSIONS SSOP20-P-225-0.65A

Unit : mm



Weight : 0.09g (Typ.)

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Notice for Pb free product
About solderability, following conditions were confirmed
Solderability
(1) Use of Sn-36Pb solder bath
• solder bath temperature = 230
• dipping time = 5seconds
• the number of times = once
•use of R-type flux
(2) Use of Sn-3.0Ag-0.5Cu solder bath
• solder bath temperature = 245
•dipping time = 5seconds
 the number of times = once

RESTRICTIONS ON PRODUCT USE

use of R-type flux

000707EBA

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